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Stationary FM 863 MHz

Stationary FM System Design Guide and Manual

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"You stand behind your product wonderfully."

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Stationary FM 863 MHz

Design Guide

Don't miss a single sound.

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Frequency Modulation (FM) Technology Overview

Frequency modulation or (FM) is a means of transmitting audio using electromagnetic waves. This same technology is used by local FM radio stations to broadcast music. FM signals can travel through most barriers – walls, floors, and ceilings. The distance a signal travels has many different variables such as Radio Frequency (RF) output power, the type and placement of the antenna, and the broadcasted frequency. Unlike infrared, FM transmission are not secure. This enables a receiver to travel further distances from the source. This section of the manual will help you design a system that will get the best range and least amount of interference.

FM Receiver

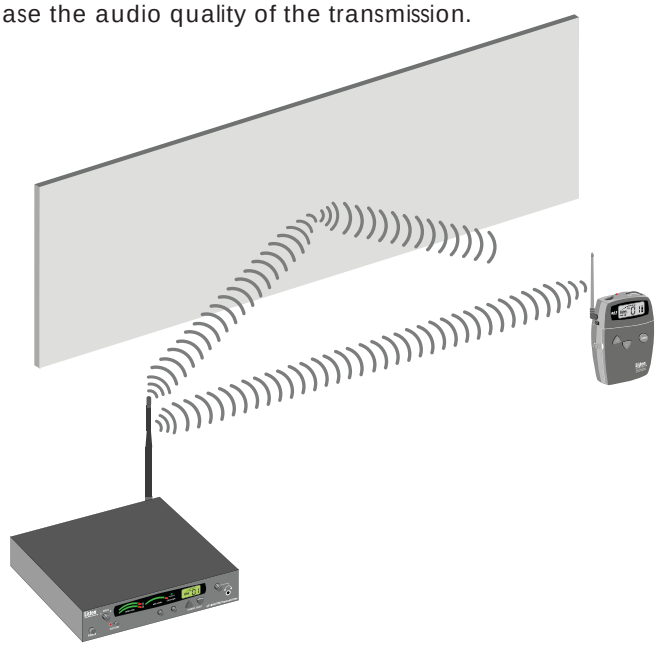
Audio Source

FM Transmitter

When designing an FM system it is important to keep the following in mind:

- ***Multipath***

  Multipath interference is a form of RF interference that occurs when radio signals have more than one path between the receiver and the transmitter causing the two RF signals to add out of phase. This could occur in areas with RF-reflective surfaces, such as furniture, walls, or floors. The result of multipath is the receiver audio coming in and out of squelch when the receiver is moved. Portable applications are much more susceptible to multipath than those that are stationary. Multipath distortion is often worse as the distance between transmitter and receiver increases (RF power decreases). Multipath can decrease the audio quality of the transmission.



- ***Antenna placement***

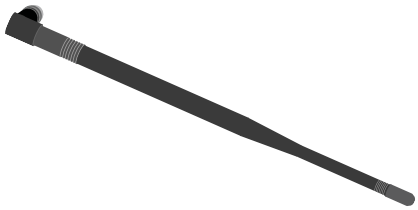
  The antenna should be placed as high as possible and in line of sight of the receivers. The antenna should not be mounted near metal objects. Keeping the coaxial cable as short as possible will also limit the loss of RF power. The LT-800 comes equipped with an articulating right angle dipole antenna (LA-129). The remote antenna kit (LA-130) is an optional accessory. The antenna on the receivers should always be in the upright position to maximize the transmission range. Placing the antenna in areas where the RF cannot properly be transmitted will limit the range of transmission.

System Overview

There are four main parts to a Stationary FM system – transmitter, antenna, receiver and input source, .

LT-800-863 Stationary FM Transmitter (863 MHz)

Input source



LA-129 90° Articulating Antenna (863 MHz)
(Included with Transmitter)

LR-400-863
Portable Display FM
Receiver (863 MHz)

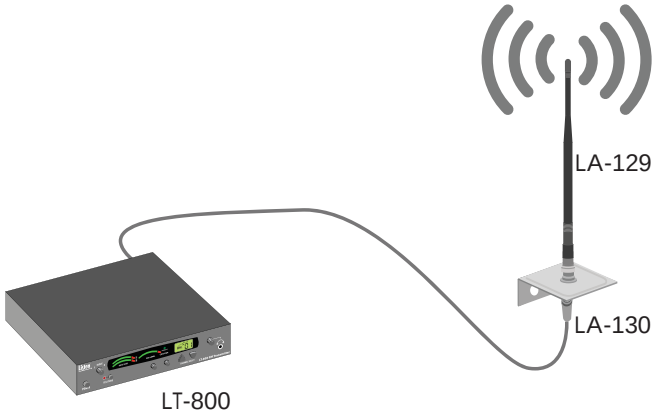
LR-500-863
Portable Programmable
Display FM Receiver
(863 MHz)

Input Source

The input source can be audio from a sound board, microphone or a personal audio source like a CD player, MP3 player, computer, DVD, etc. Audio will be Connected into the audio inputs of the stationary transmitter.

Transmitter

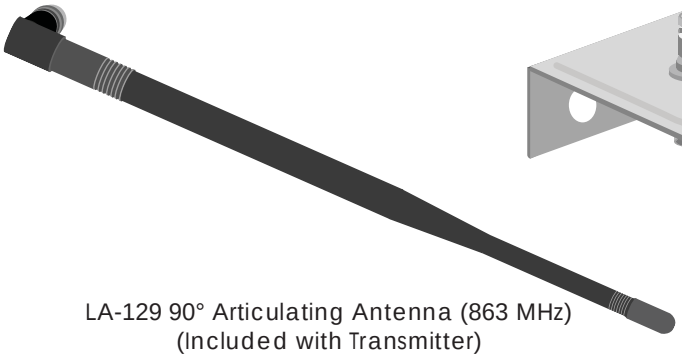
The LT-800 transmitter modulates the audio on an FM carrier and transmits the signal via an antenna.



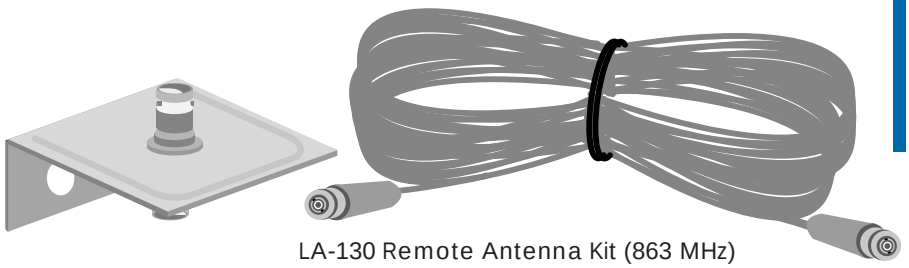
System Overview

Antenna

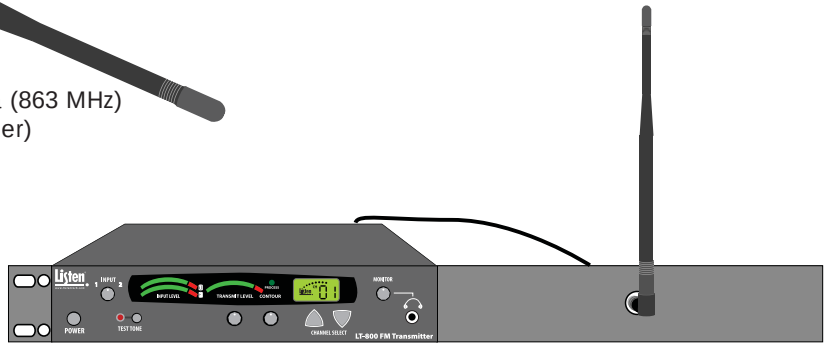
There are a several options for antennas. Antennas can either be back-mounted on the unit or remote mounted.



LA-129 90° Articulating Antenna (863 MHz)
(Included with Transmitter)



LA-130 Remote Antenna Kit (863 MHz)



LA-131 Antenna Kit for Rack Mount (863 MHz)

Receivers

Listen offers two different portable receivers: the LR-400 and LR-500.

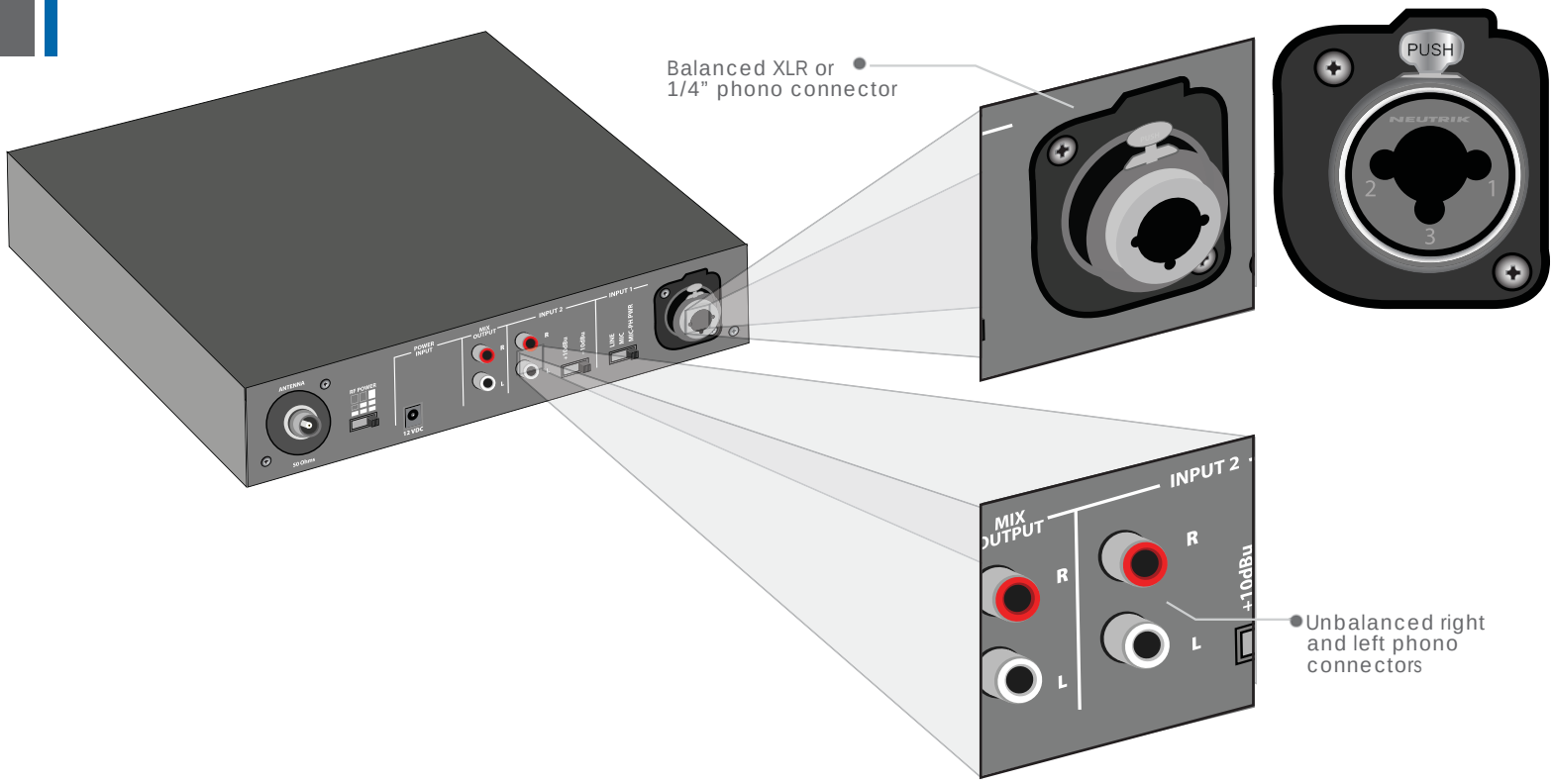
LR-400-863
Portable Display FM
Receiver (863 MHz)

LR-500-863
Portable Programmable
Display FM Receiver
(863 MHz)

Key Concepts in Designing a Stationary FM System

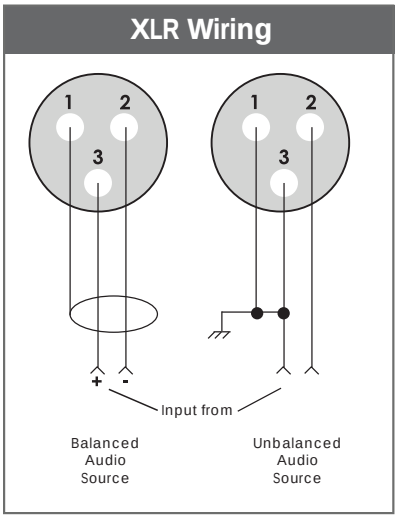
Input Selection

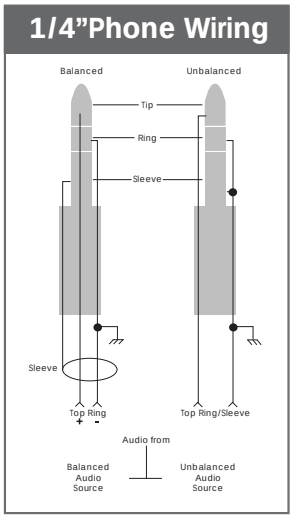
The LT-800 has two audio input options: Input 1 and Input 2. Input 1 is a balanced connection using either an XLR or ¼" phono connector, and input 2 is two unbalaned phono connectors. Use Input 1 if you are using a microphone or if you have a balanced connection such as from a professional audio mixer (you can also use Input 1 for unbalanced connections). Use Input 2 to connect to an unbalanced audio source.



Input 1: Connect the audio source(s)

Connect the audio source(s) to one or both audio input connections. Input 1 offers a choice of balanced XLR or ¼" phono connector. Plug your microphone into Input 1 and move the input select switch to Mic (for dynamic microphones) or Mic + PH Power (for condenser microphones). A feed from a soundboard can also used with Input 1. Be sure the input type selected (line, mic or mic-PH PWR) matches with the output type. The following is a wire diagram for Input 1 balanced and unbalanced connections:





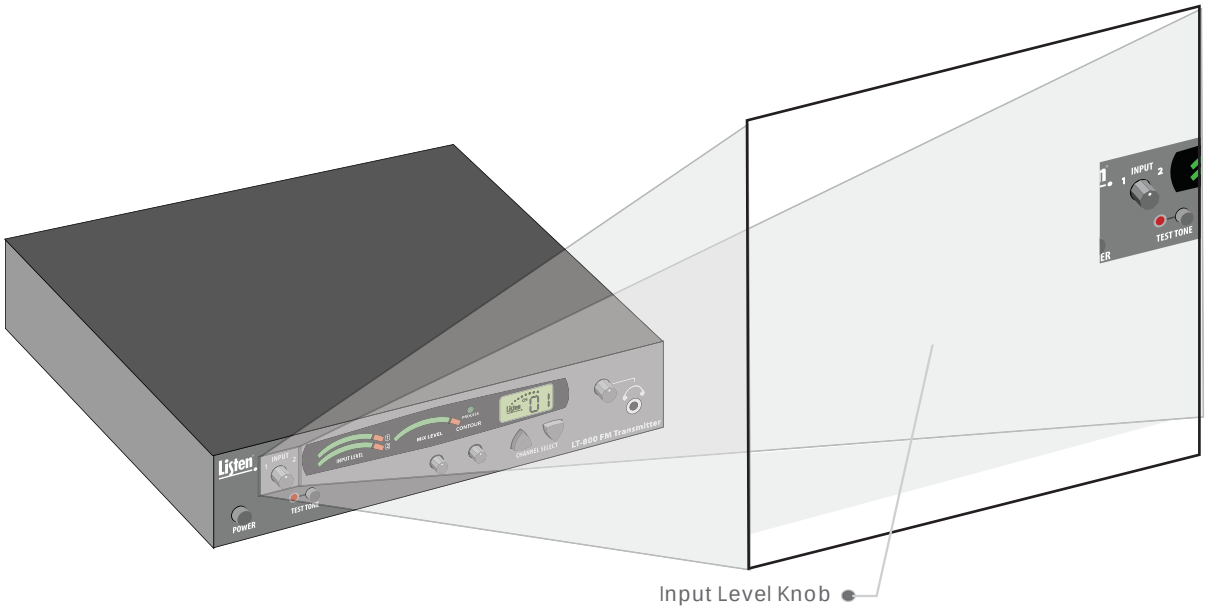
Key Concepts in Designing a Stationary FM System

Input 2: Connect the audio source(s)

Plug your unbalanced audio source into Input 2 and select the audio level switch for -10 dBu or +10 dBu to match the audio level coming from your equipment.

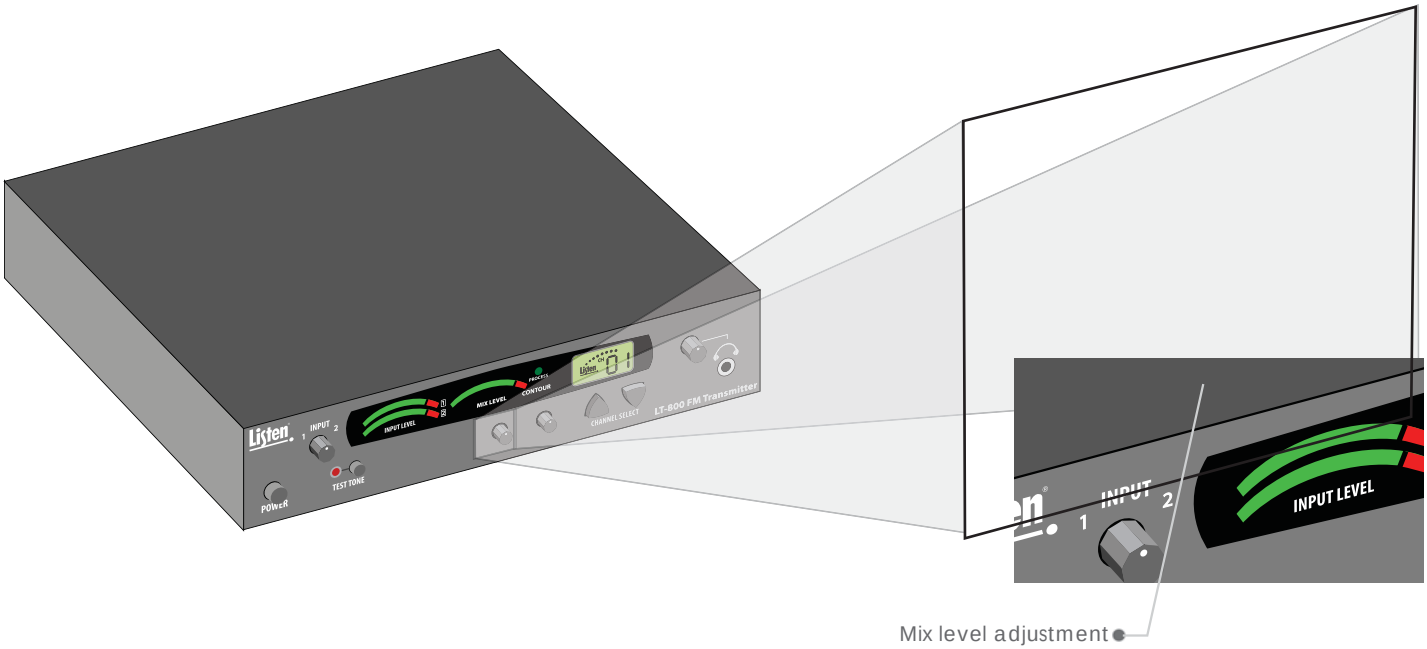
Using Two inputs

The LT-800 can accommodate two inputs simultaneously with the use of the input level potentiometer. When two inputs are present, both sets of input level lights will be activated.



Mix Level

The mix level acts as the “master transmit” control. It will increase the transmit gain on the “mix” of the two levels (if two levels are in use).



Key Concepts in Designing a Stationary FM System

Selecting Transmitting Frequencies

Use this section of the guide to choose the channel settings for the transmitter and receivers.

Find transmission channel(s)

The goal is to find a transmission channel(s) that is free from interference. Interference comes from other transmitters and from other equipment (such as a computer).

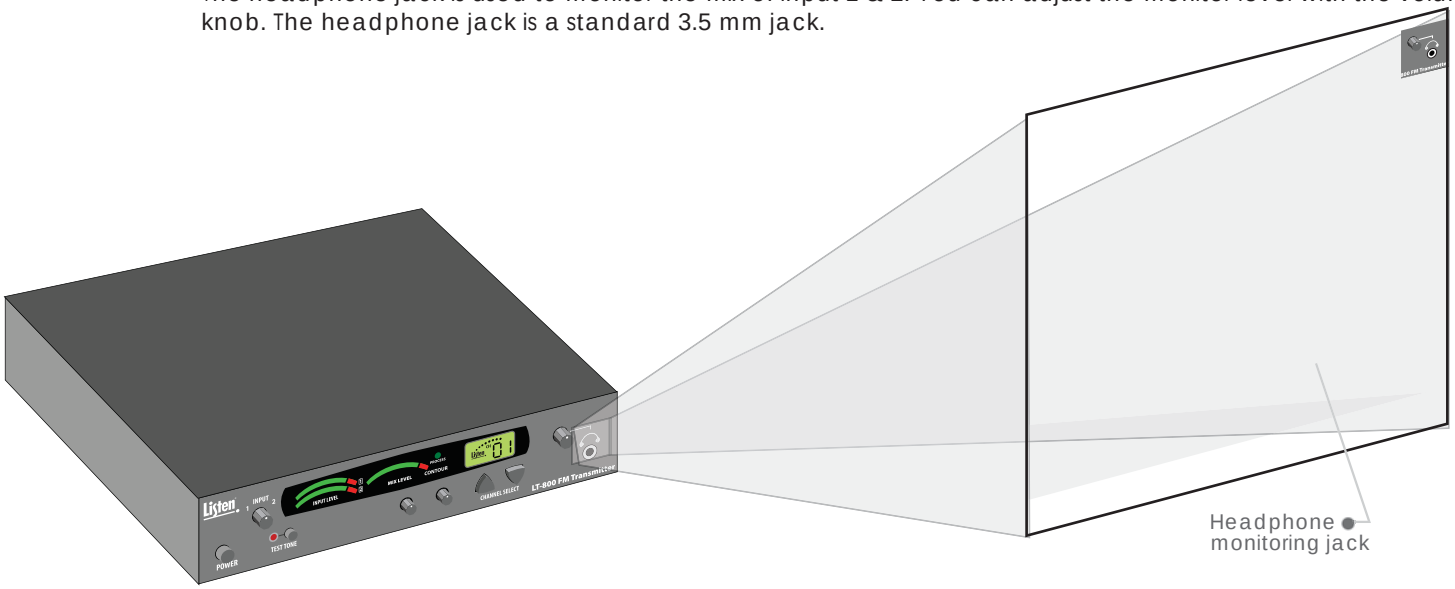
Listen's LT-800-863 offers 17 different channels to choose from

Listen's LT-800-863 offers 17 different channels to choose from. This increases the chance you'll find an interference free channel. The best way to check for interference is to turn a receiver on and press the SEEK button. If there are any channels with interference, the receiver will find these channels. Do not transmit on these channels.

Testing System

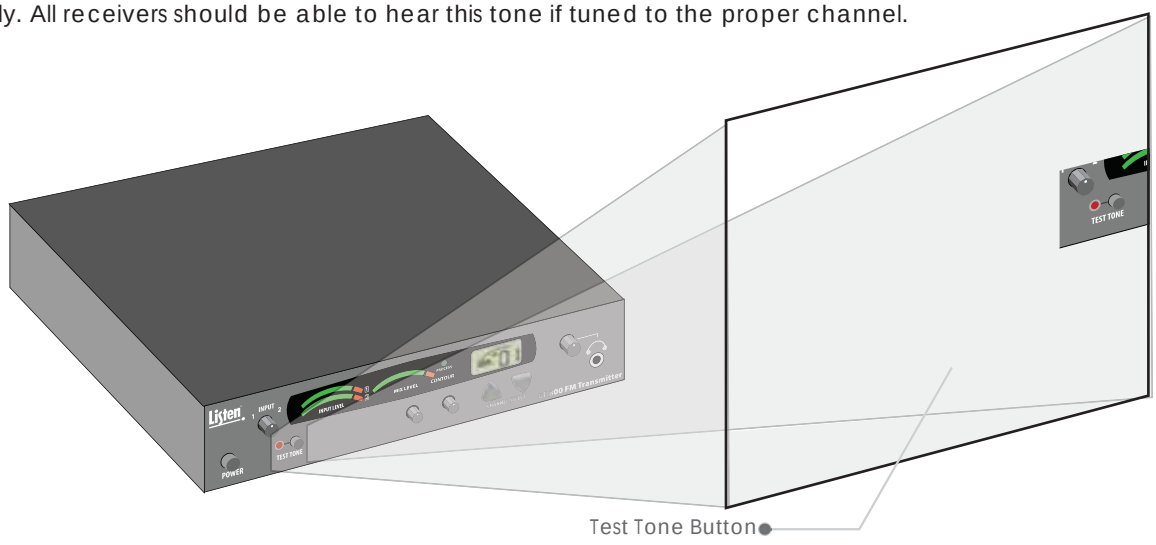
Monitor Jack

The headphone jack is used to monitor the mix of input 1 & 2. You can adjust the monitor level with the volume knob. The headphone jack is a standard 3.5 mm jack.



Test Tone

Use the test tone to transmit a 400 Hz tone. This tone will allow the end user to know if the system is transmitting properly. All receivers should be able to hear this tone if tuned to the proper channel.



Key Concepts in Designing a Stationary FM System

Antenna placement (rear or remote)

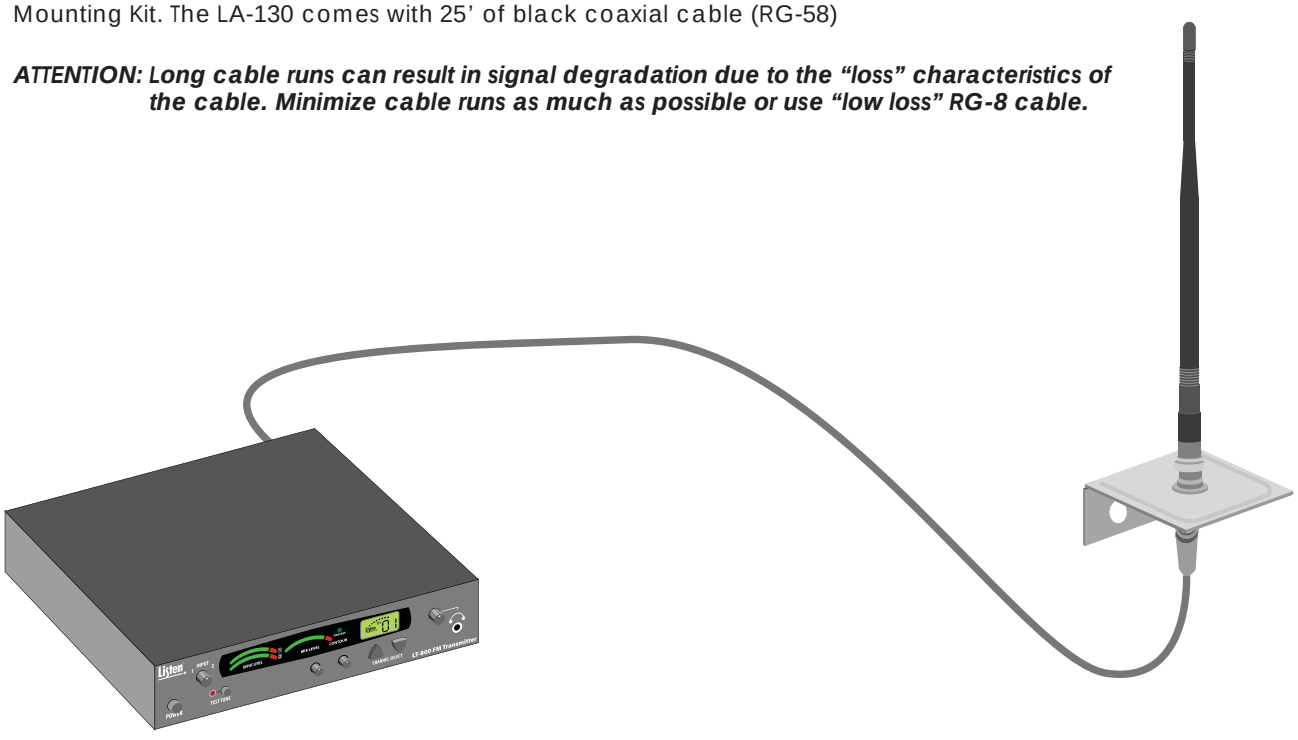
Rear mounted antenna

Rear mounting the LA-129 90° Articulating Antenna (863 MHz) will allow the transmitter to be moved if necessary.

Remote antenna

The LA-130 Remote Antenna Kit connects to the LT-800 and can be placed away from the transmitter for better range. It also allows the unit to be rack mounted with the antenna remotely using the LA-326 Universal Rack Mounting Kit. The LA-130 comes with 25' of black coaxial cable (RG-58)

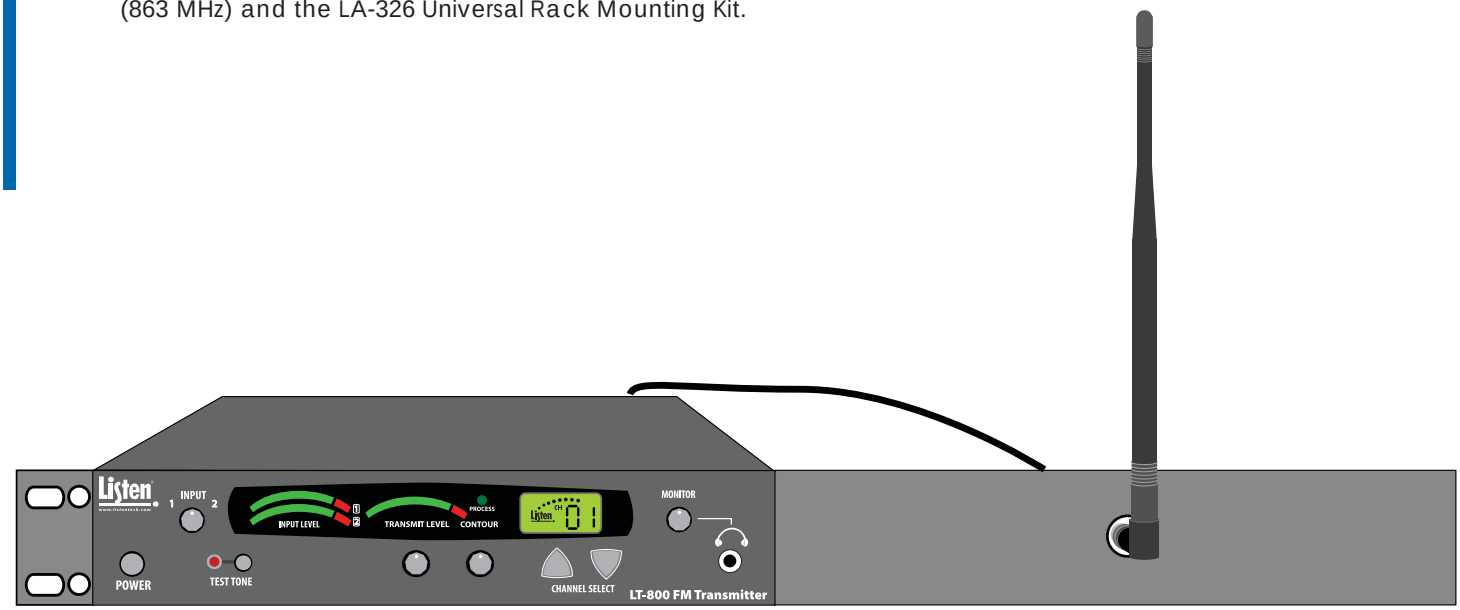
ATTENTION: Long cable runs can result in signal degradation due to the "loss" characteristics of the cable. Minimize cable runs as much as possible or use "low loss" RG-8 cable.



Key Concepts in Designing a Stationary FM System

Front of the rack mounted antenna

The antenna can also be in the front of the rack with the use of the LA-131 Antenna Kit for Rack Mount (863 MHz) and the LA-326 Universal Rack Mounting Kit.



Maximizing Transmission Range

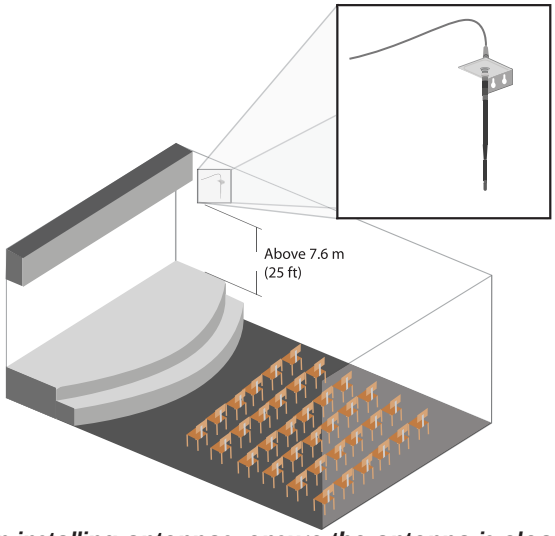
For proper and dependable operation, Listen receivers need to receive a strong and consistent signal from the originating transmitter. The following strategies should be used maximize this signal:

Transmitting and receiving antennas

When designing and installing your system, keep in mind that the location of both the transmitting and receiving antennas is critical to maximize broadcast range. Eliminate or minimize obstructions between the transmitting and receiving antenna. Minimize the distance between the transmitting and receiving antennas. Move transmitting and receiving antennas away from metal or conductive objects.

Antenna Placement

Place the transmitting antenna as high as possible. The antenna should always be oriented upwards. If the height of the antenna exceeds 7.6 m (25 ft.), the antenna should be placed with the radial facing downward (as shown in diagram).



CAUTION: When installing antennas, ensure the antenna is clear of power lines.

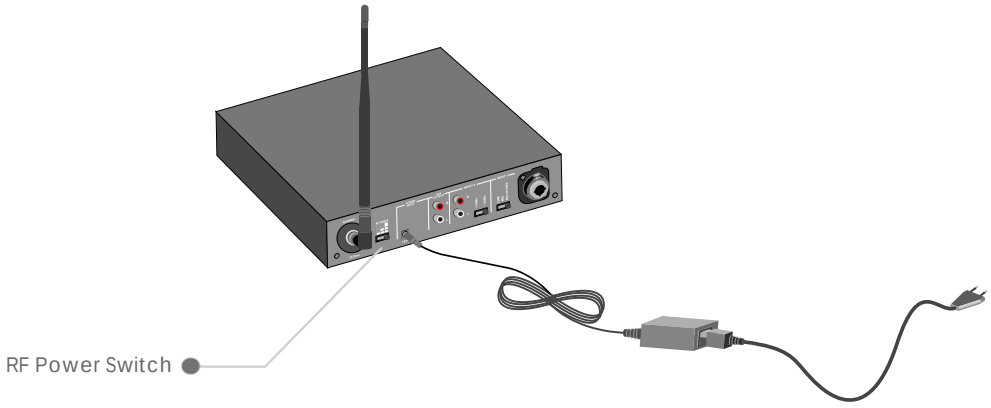
Key Concepts in Designing a Stationary FM System

Orientation

Orient both transmitting and receiving antennas vertically.

RF Power switch

Position the RF Power switch on the back of the LT-800 to full RF Power, unless lower power is necessary.



Cable Length

Keep coaxial cable from transmitter to antenna as short as possible.

Key Concepts in Designing a Stationary FM System

Mounting Transmitter

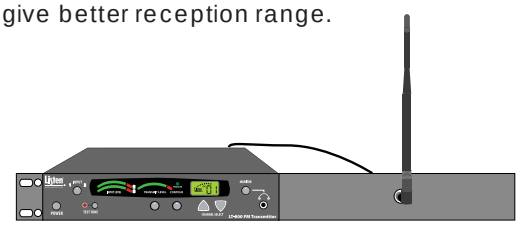
The LT-800 can be rack mounted if necessary. With the use of the Listen LA-326 Universal Rack Mount Kit, you can mount one or two transmitters to the standard 19" rack. The rack mounted unit will take 1 ru of space.

Rack Mount with dual units installed.

Rack Mount with single unit installed.

NOTE: The antenna may need to be remote mounted using the LA-130 Remote Antenna Kit if the transmitter(s) is rack mounted. If a rack is metal, it is not recommended to have the antenna inside. Also, the depth of the rack and equipment inside could prevent an antenna from being placed inside.

The LA-131 rack mount accessory will allow you to place your LA-129 antenna at the front of the rack. Having the antenna in the front will give better reception range.



Key Concepts in Designing a Stationary FM System

Multiple Channels

Guidelines for multiple channels in multiple and single spaces.

Example #1

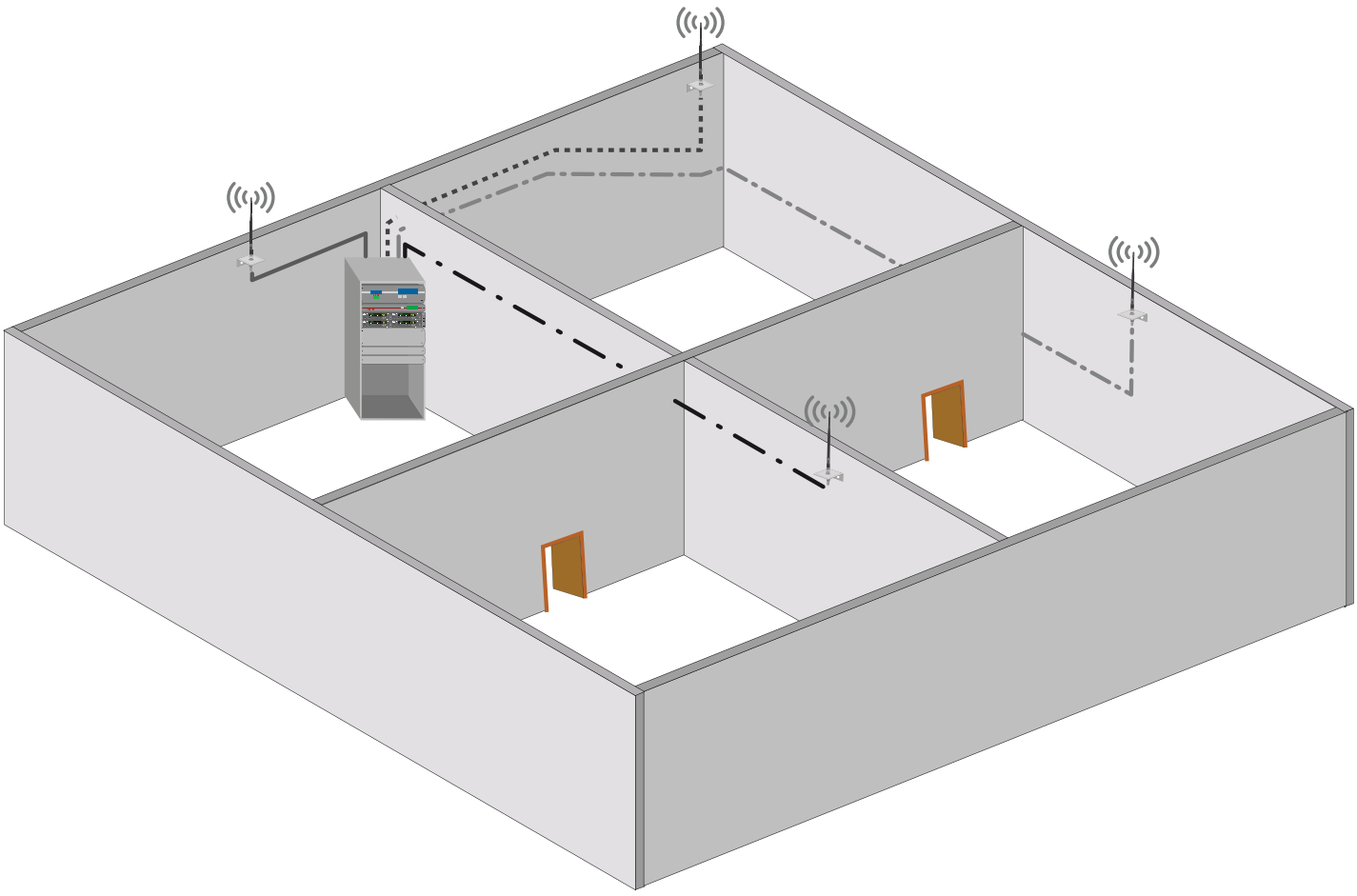
A museum patron walks to an exhibit and needs to listen to one channel at a time.

In general, such systems work very well because of what is called "capture effect". A Listen receiver will lock onto or "capture" the strongest FM signal. If the receiver is near a dominating transmission signal, it will ignore other interference – even if it is on the same channel. In theory, you can have an infinite number of transmitters operating in this scenario. However, to reduce the possibility of the receiver accidentally receiving interfering transmissions, use the following guide lines:

- Reduce the transmission power on the rear of the LT-800 Stationary Transmitter to the lowest level possible.
- Get the transmitting antenna as close to the receivers as possible.
- Increase the squelch threshold on the receivers if necessary.
- Choose adjacent broadcast channels with the highest channels spacing. Try to get the channel spacing to be at least 300 KHz apart.
- Receiver DX and Local –

  DX Mode – Both strong and weak channels will be automatically tuned. This will increase the range of the transmission.

  Local mode – Only strong channels will be automatically tuned in.

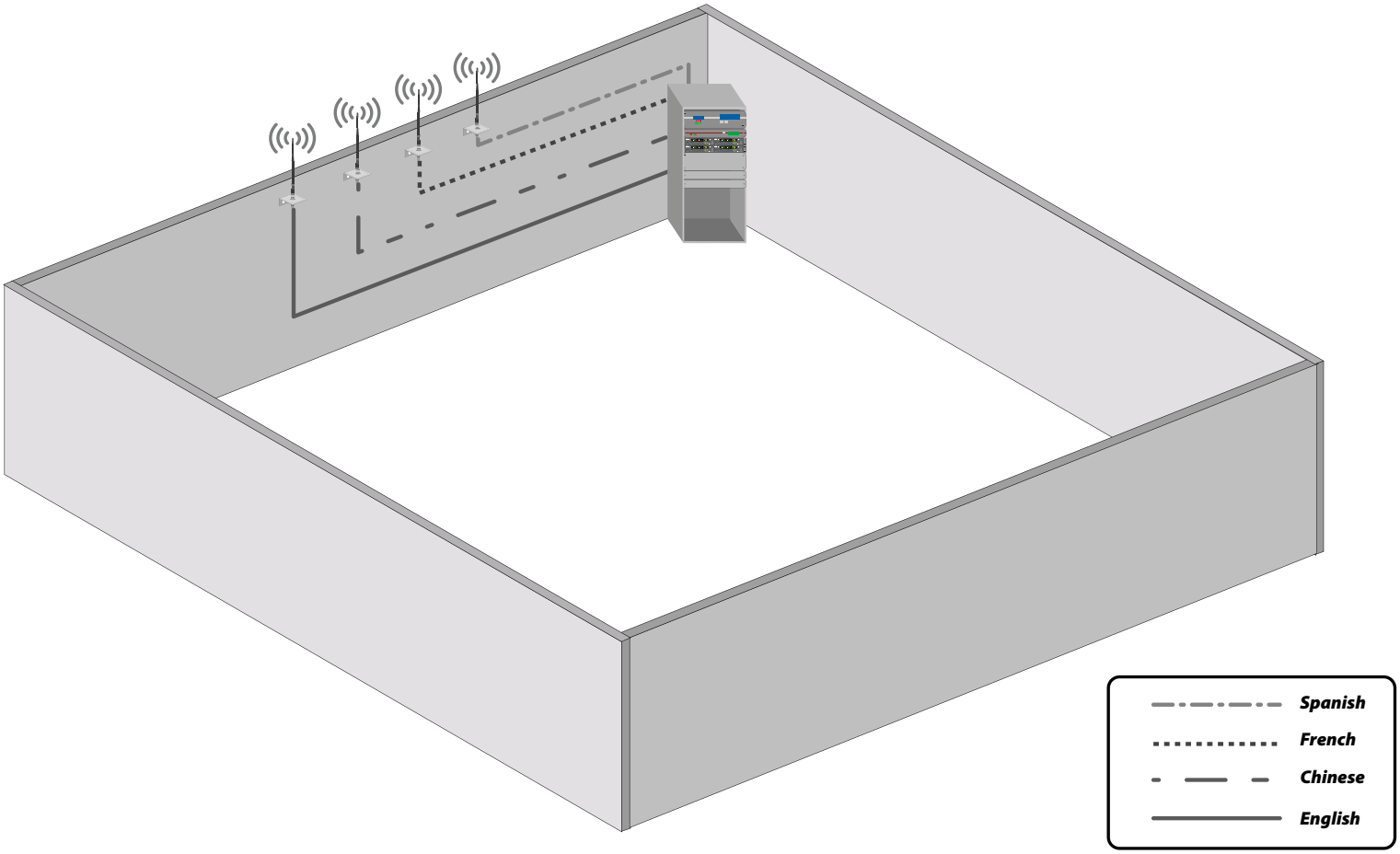


Key Concepts in Designing a Stationary FM System

Example #2

Meeting participants need to select any one of, say, four language interpretations of the meeting.

- In general, space the channels as far as possible from each other. For example, if four channels are needed from transmitting signals, using channels 1, 4, 8, and 12 would be recommended (please see the channel/frequency chart on page 70 for the list of frequencies).
- Space the antennas at least one wave length from each other. A wave length at 863-864 MHz is 33 cm (13 in.).
- In these applications, it would be beneficial to use the LR-500-863 Portable Programmable Display FM Receiver (863 MHz) to "lock out" any unwanted channels. The receiver would only see the frequencies currently being used within the room.
- DX and Local mode can be used for the receiver to SEEK and find only the strongest signals.



Notes

Notes

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Stationary FM 863 MHz

LT-800-863 Stationary FM Transmitter

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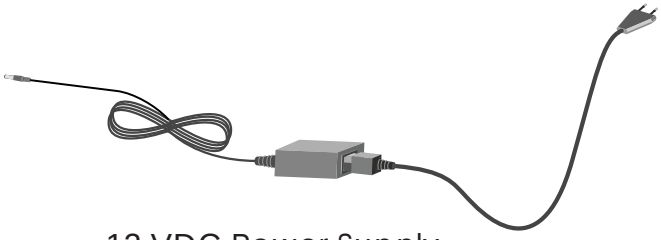
LT-800-863 Package Contents

- LT-800-863
- Quick Reference Sticker
- LA-129 90° Articulating Antenna
- 12 VDC Power Supply
- Line Cord
- Quick Reference Card
- Warranty Card
- Manual Card

LT-800-863 Stationary FM Transmitter

LA-129 90° Articulating Antenna (863 MHz)



12 VDC Power Supply

Listen Configurations

- LT-800-863-01 (North America)
- LT-800-863-02 (Asia/UK)
- LT-800-863-03 (Euro)

LT-800 Specifications

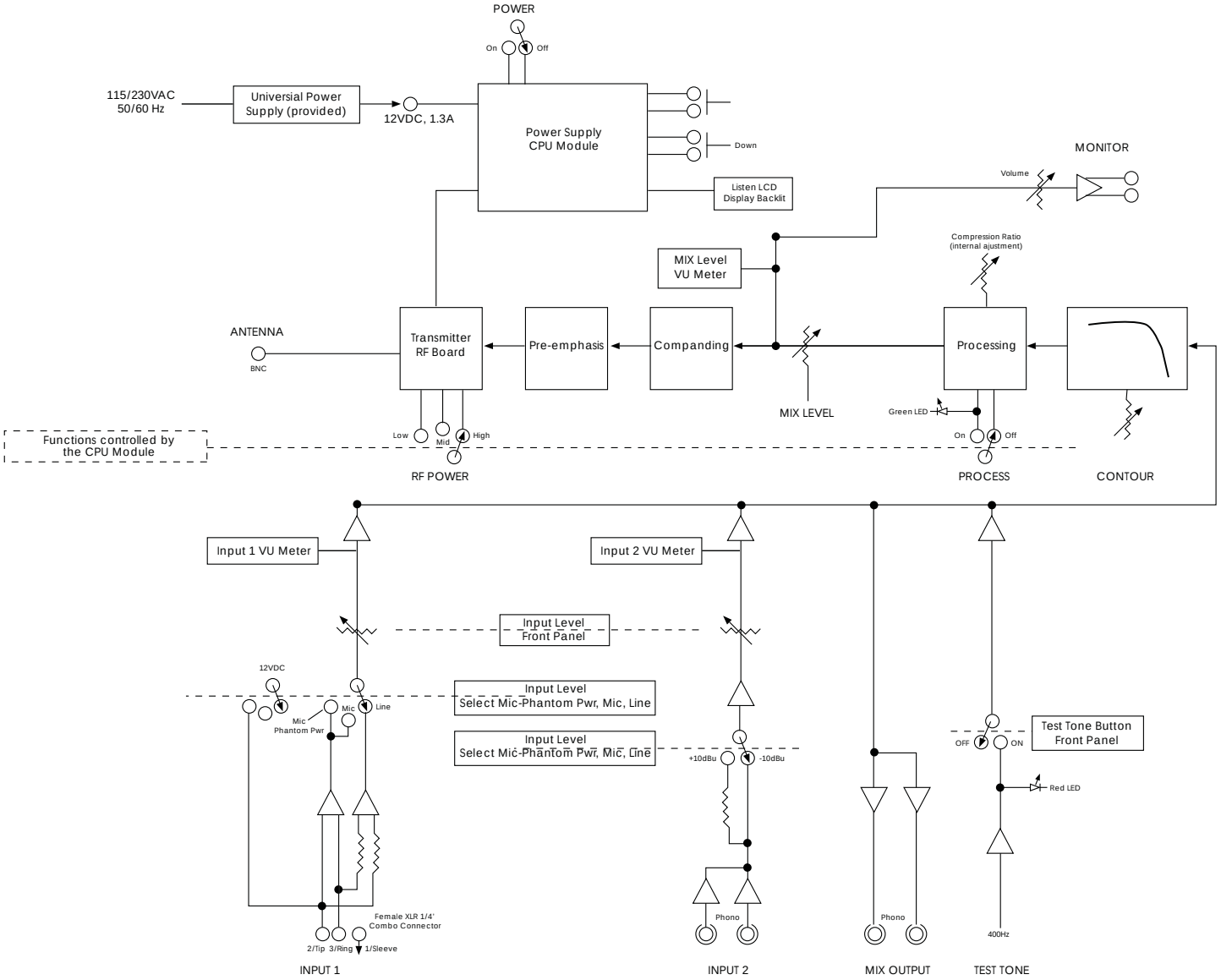
Architectural Specification

The Stationary FM Transmitter shall be capable of broadcasting on 17 channels. Channel tuning shall be capable of being locked. The transmitter shall have a SNR of 70 db or greater. The output power shall be adjustable to quarter, half or full. The device shall have an audio frequency response of 50 Hz to 15 kHz, +/-3 db. It shall have 2 mixing audio inputs and a mixed signal output. The device shall have the following audio controls: Input Levels, Mix Level, adjustable low pass filter (contour), headphone output (monitor). The device shall have an audio processor that is capable of automatic gain control and limiting. The Listen LT-800-863 is specified.

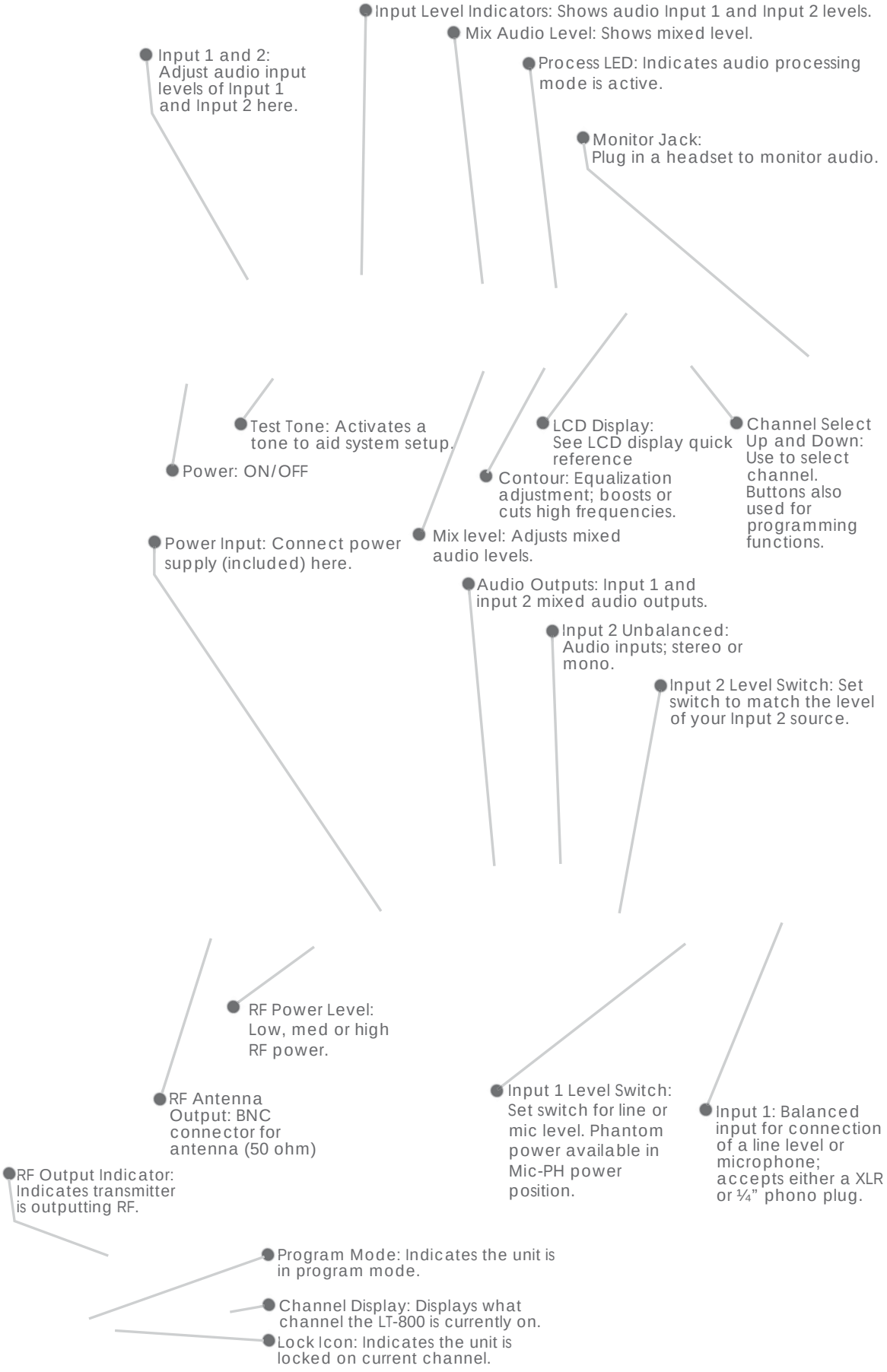
	Specifications	LT-800-863
RF	RF Frequency Range	863.050 - 864.950 MHz
	Number of Channels	17 Wideband
	Frequency Accuracy	+/-.005% stability 0- 50C
	Transmitter Stability	50 PPM
	Output Power	10mW ERP
	Peak Deviation	+/- 50 kHz
	Antenna	LA-129 90° Articulating Antenna (863 MHz)
	Antenna Connector	BNC
	Compliance	CE, ETSI, RoHS
Audio	System Frequency Response	50Hz - 15kHz (+/-3 db)
	System Signal to Noise Ratio	70db (A-Weighted)
	System Distortion	<2% THD @ 80% modulation
	Audio Input 1	Rear Panel. Female XLR and 1/4 in combo connector, balanced, 0/-55 dBU (line/mic) nominal input level adjustable, -30/+21 dBU (line/mic) maximum input level, impedance 20k/1k ohms (line/mic), phantom power +12VDC
	Audio Input 2	Rear Panel. (2) Phono Connectors, unbalanced, -10/+10dbu nominal input level adjustable, +30 dBU maximum, impedance 100K ohms
	Audio Processing (Process)	Compression can be turned on/off. Slope internally adjustable from 1:1 to 4:1. Default 2:1
	Contour	Cuts and boosts frequencies above 5kHz
	Combined Audio Output (Mix)	Input 1 and Input 2 Mixed Output (Rear Panel). (2) phono connectors, unbalanced, -10 dBU nominal output level, +19dbu maximum, impedance 10 ohms
	Headphone Output (Monitor)	Front Panel. (One) 3.5 mm stereo connector, unbalanced, adjustable output level, +7dbu maximum, impedance 10 ohms. 100mW, 32ohms
Controls	Front Panel	Power, Test Tone on/off, Channel up/down, Input Levels, Mix Level, Contour, Monitor volume control
	Rear Panel	Input 1 Level, (Line, Mic, Mic-Phantom Power), Input 2 level (-10/+10dbu), RF power level (low, mid, high)
	Internal Adjustments	Compression ratio for audio processor
	Programming	Process on/off, Channel lock
Indicators	Input 1, Input 2, Mix Level VU	Indicates Input 1, Input 2, and Mix audio levels. 10 segment LED's (8 green, 2 red)
	Processing	Indicated by a green LED when on (front panel)
	RF Power	Indicated on the LCD (low, mid, high)
	LCD Display	Channel Designation, lock status, RF power level, programming (front panel)
	Test Tone	Red LED illuminates when test tone is enabled.
Power	Power Supply	In line switching mode supply, Listen part number LA-206
		Input: 100-240 VAC, 47-63 Hz
		Output: 12 VDC, 1.3A
		Output Connector: .02 in (5.0mm) OD, .01 in (2.5 mm) ID, barrel type
		Compliance: UL, CUL, PSE, TUV, CB, CE, RoHS
	Power Line Cord (detachable)	North America, Type B, (LT-800-863-01)
		Asia, UK, Type G, (LT-800-863-02)
		Euro Type J, (LT-800-863-03)
Physical	Dimensions (H x W x D)	1.75 x 8.50 x 9.13 in (4.5 x 21.5 x 23 cm)
	Color	Dark Grey with white silk screening
	Unit Weight	2.7 lbs (1.10 kg)
	Unit Weight with LA-207-03 Power Supply	2 lbs.14 oz. (1.30 kg)
	Shipping Weight	3 lbs. 2oz. (1.42 kg)
	Rack Mounting	One rack space height, 1/2 rack space wide. One or two transmitters can be mounted in one rack space. Optional Rack mount (LA-326) and LA-131 antenna kit for rack mount not included.
Environmental	Temperature - Operation	-10C (14F) to +40C (104F)
	Temperature - Storage	-20C (-4F) to +50C (122F)
	Humidity	0 to 95% Relative Humidity, non condensing

Specifications are subject to change without notification

LT-800-863 Block Diagram



LT-800-863 Quick Reference


Input Level Indicators: Shows audio Input 1 and Input 2 levels.
Mix Audio Level: Shows mixed level.
Input 1 and 2: Adjust audio input levels of Input 1 and Input 2 here.
Process LED: Indicates audio processing mode is active.
Monitor Jack: Plug in a headset to monitor audio.
Test Tone: Activates a tone to aid system setup.
LCD Display: See LCD display quick reference
Channel Select Up and Down: Use to select channel. Buttons also used for programming functions.
Power: ON/OFF
Contour: Equalization adjustment; boosts or cuts high frequencies.
Mix level: Adjusts mixed audio levels.
Power Input: Connect power supply (included) here.
Audio Outputs: Input 1 and input 2 mixed audio outputs.
Input 2 Unbalanced: Audio inputs; stereo or mono.
Input 2 Level Switch: Set switch to match the level of your Input 2 source.
RF Power Level: Low, med or high RF power.
RF Antenna Output: BNC connector for antenna (50 ohm)
Input 1 Level Switch: Set switch for line or mic level. Phantom power available in Mic-PH power position.
Input 1: Balanced input for connection of a line level or microphone; accepts either a XLR or ¼" phono plug.
RF Output Indicator: Indicates transmitter is outputting RF.
Program Mode: Indicates the unit is in program mode.
Channel Display: Displays what channel the LT-800 is currently on.
Lock Icon: Indicates the unit is locked on current channel.

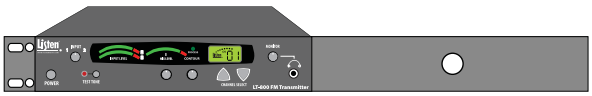
LT-800 Setup Instructions

1 Unpack the Product

Remove outer packaging and plastic cover. Verify all components are present and no physical damage has occurred to the product.

2 Mount LT-800(s) in Rack (if desired)

If rack mounting the transmitter(s), install the optional rack mount kit (part LA-326) according to the instructions included with the kit.

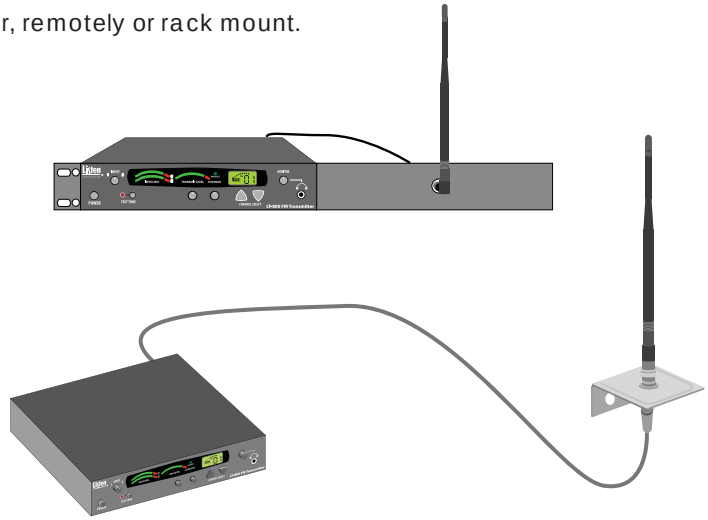


Rack Mount with single unit installed.

Rack Mount with dual units installed.

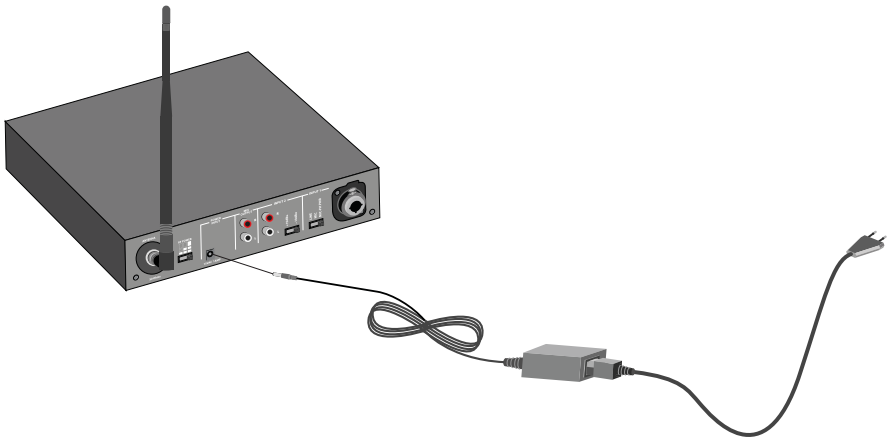
3 Connect Antenna

Connect antenna to rear of transmitter, remotely or rack mount.



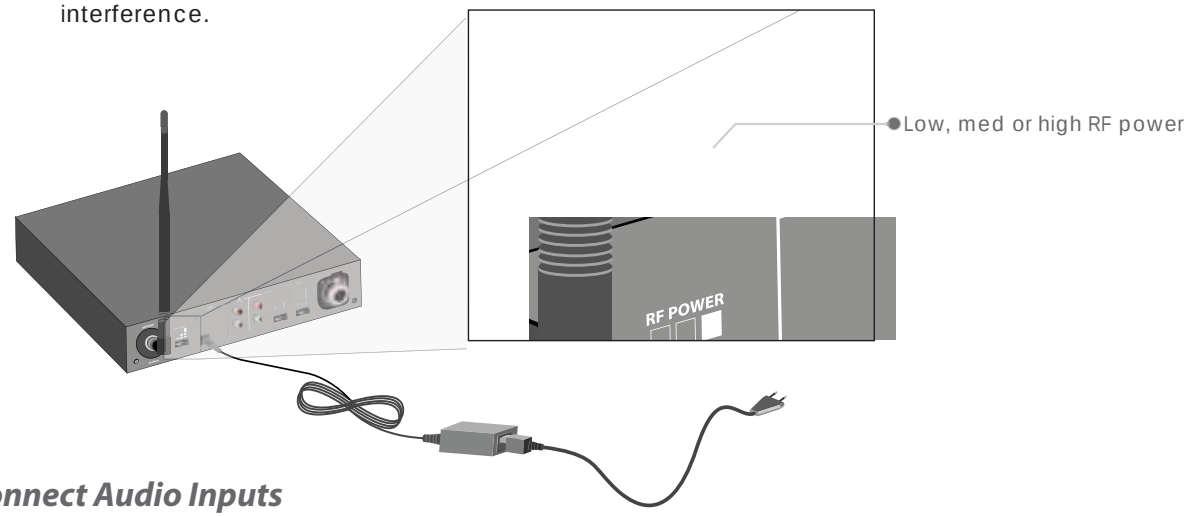
4 Connect Power

Plug the power supply into the power connector on the back panel and then plug the power supply into an outlet. Only use a Listen approved power supply (12 VDC).



5 Set RF power

Set the RF POWER switch on the back of the unit to Full, ½ or ¼ (Level is indicated on the LCD display by number of dots above Listen logo). The amount of transmitted RF power that you will need depends on your application. If you are operating multiple transmitters in the same environment, it is best to set the transmitter's output power to its lowest level to reduce the possibility of interference.

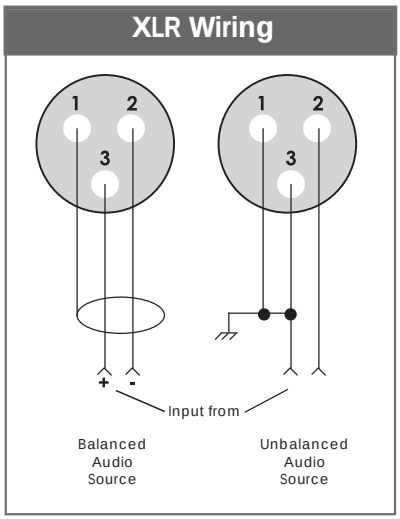


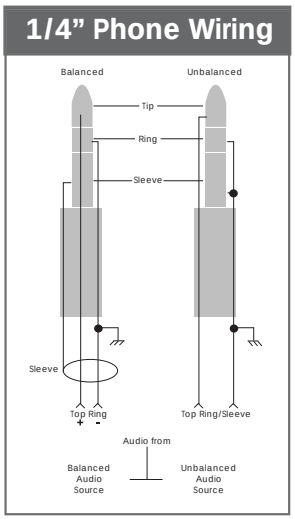
6 Connect Audio Inputs

The LT-800 has two audio input options: Input 1 and Input 2. Input 1 is a balanced connection using either an XLR or ¼" phono connector. Input 2 has two unbalanced mixing phono connectors. Use Input 1 if you are using a microphone or if you have a balanced connection such as from a professional audio mixer (you can also use Input 1 for unbalanced connections). Use Input 2 to connect to an unbalanced audio source.

6A Input 1

Connect the audio source(s) to one or both audio input connections. Input 1 offers a choice of balanced XLR or ¼" phono connector. Plug your microphone into Input 1 and move the input select switch to Mic (for dynamic microphones) or Mic + PH Power (for condenser microphones). Plug your balanced or unbalanced audio source into Input 1. Use the following diagram:



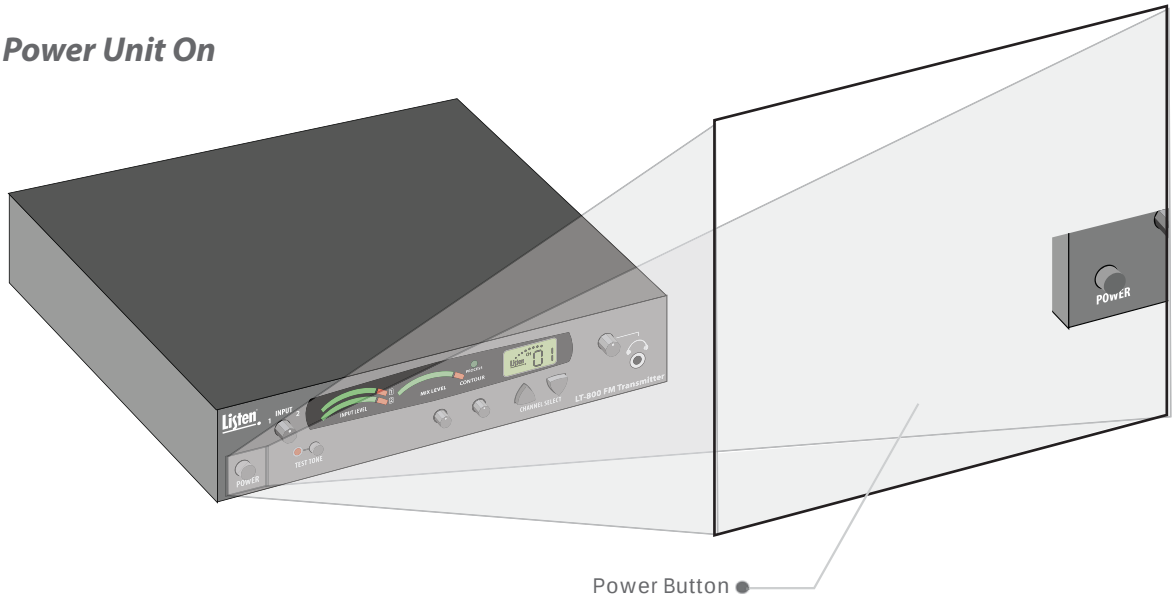


6B Input 2

Plug your unbalanced audio source into Input 2 and select the audio level switch for -10 dBu or +10 dBu, to match the audio level coming from your equipment.

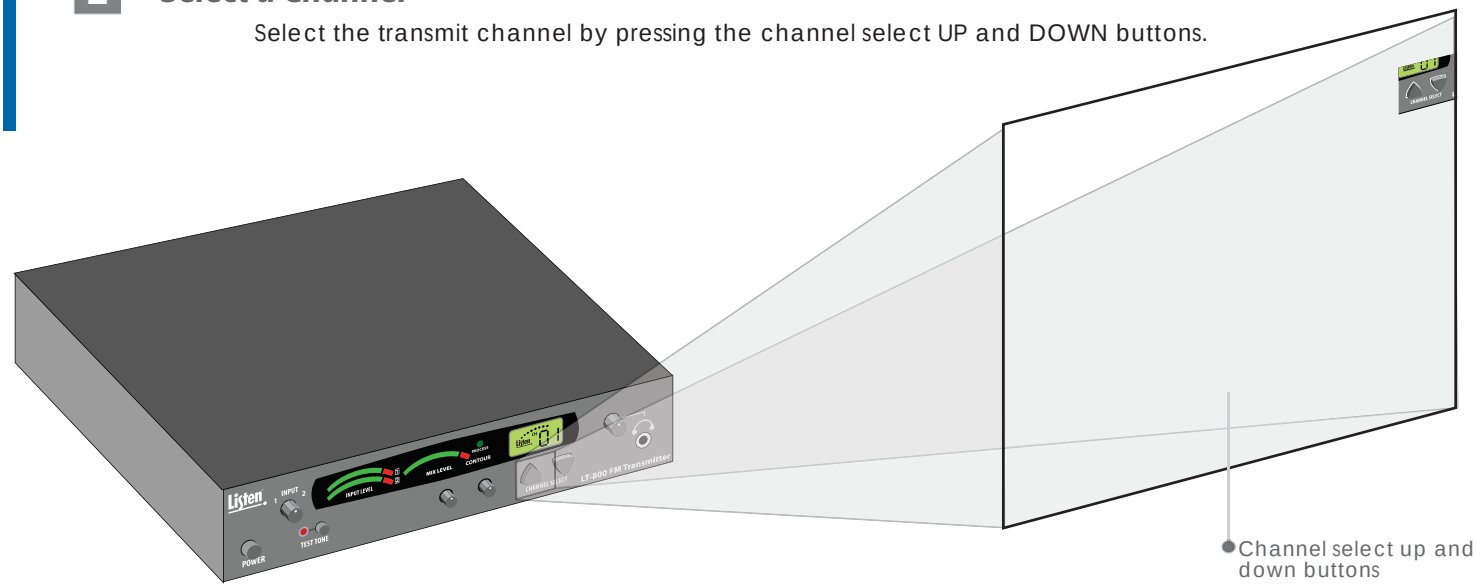
LT-800 Operating Instructions

1 Power Unit On



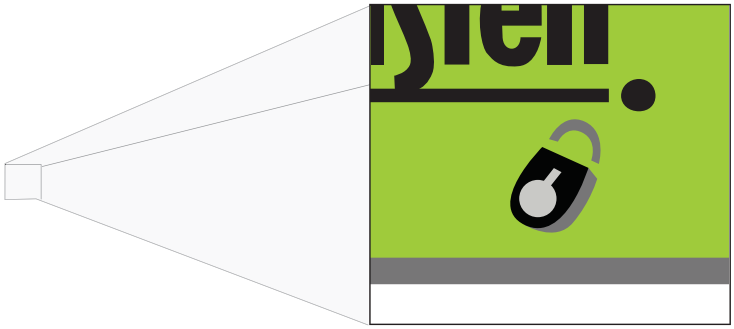
2 Select a Channel

Select the transmit channel by pressing the channel select UP and DOWN buttons.



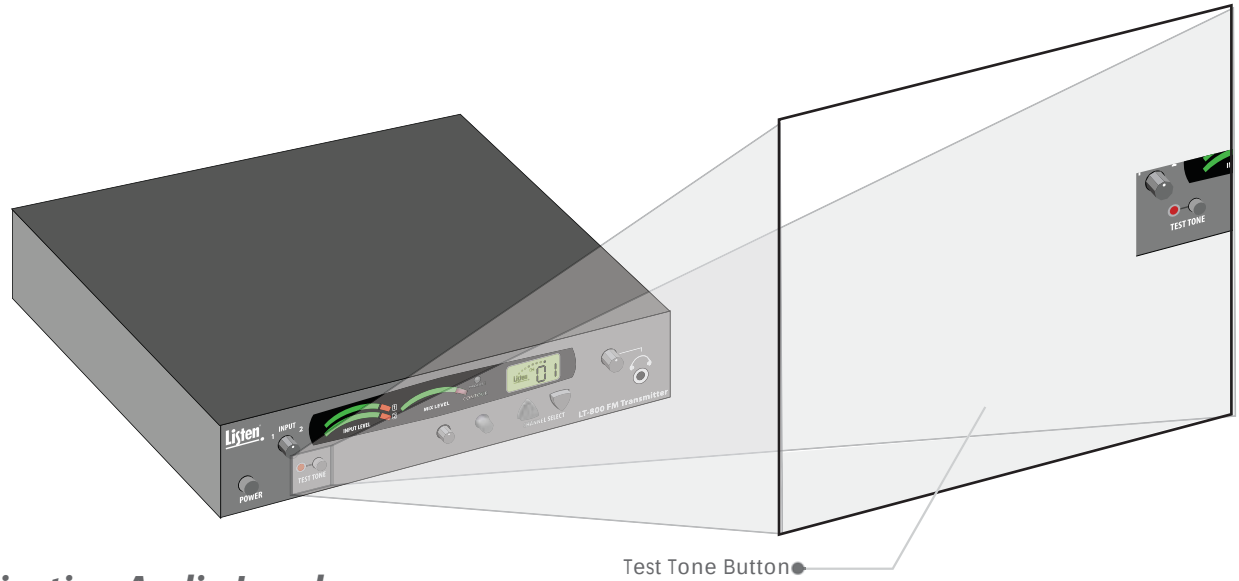
3 Lock on Channel

Once you determine your transmit channel, you can lock the transmitter on that channel. To lock a channel hold the Channel Select “Up” button for 3 seconds until the padlock icon appears on the display. To unlock, repeat this process and the padlock icon will disappear.



4 Test Tone (if necessary)

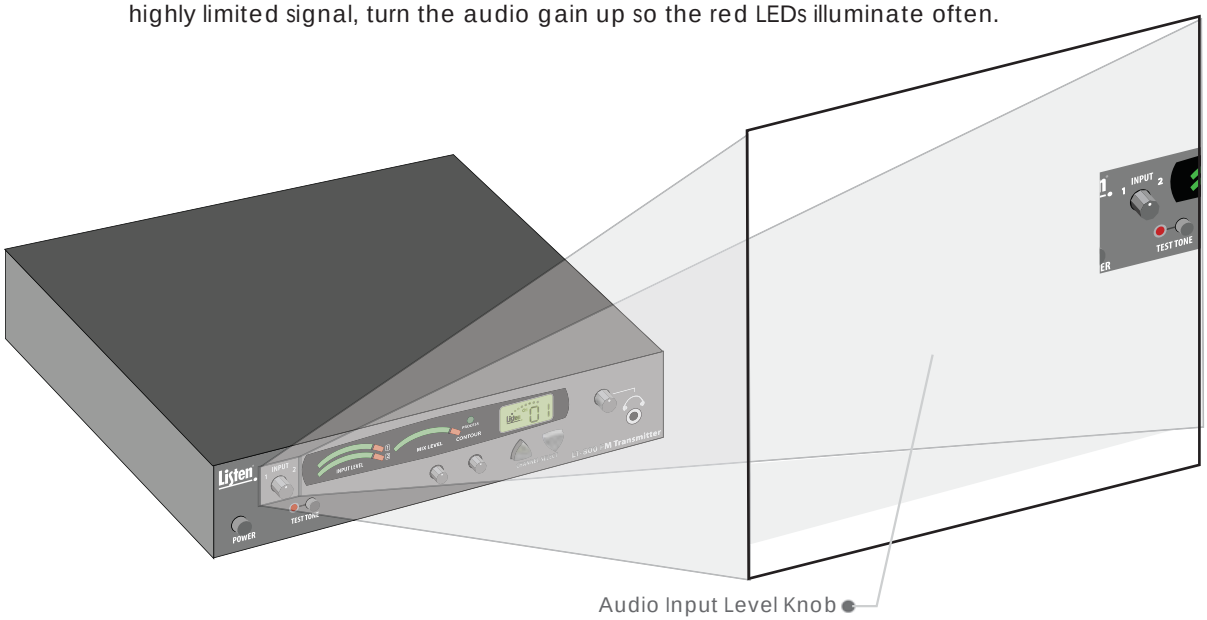
Use the test tone to transmit a 400 Hz tone. This tone will allow the end user to know if the system is transmitting properly. All receivers should be able to hear this tone if tuned to the proper channel.



Adjusting Audio Levels

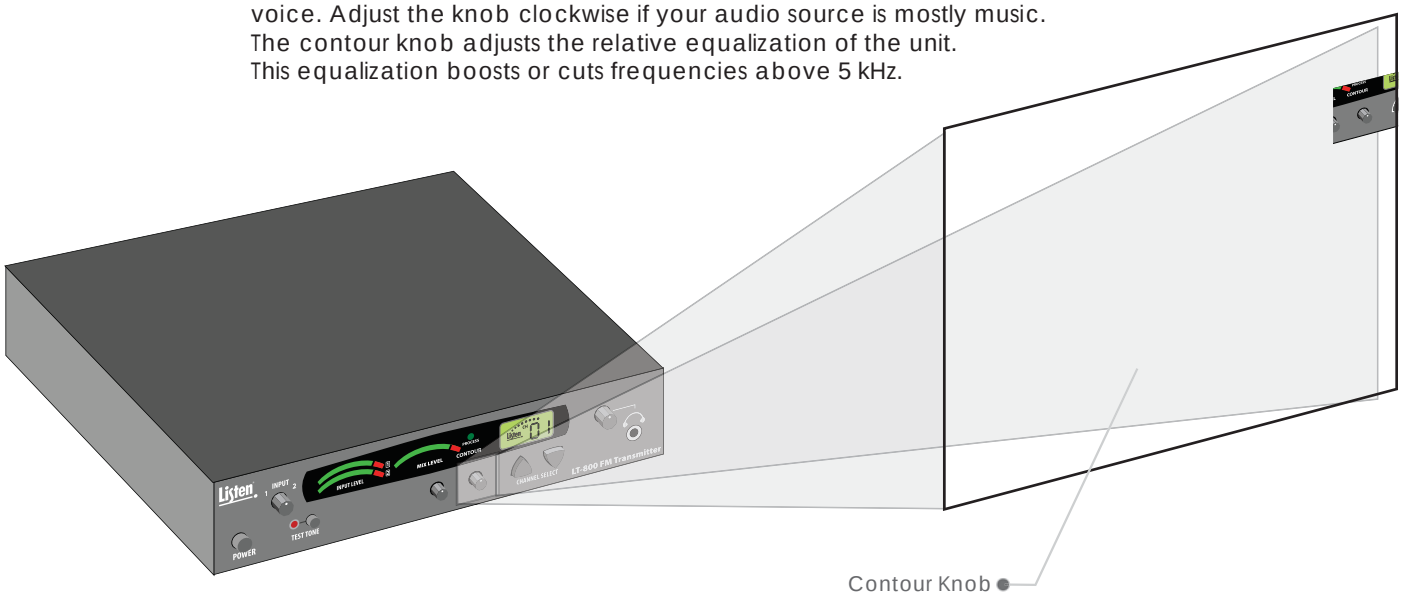
1 Adjust Audio Input Level

Adjust the input knob counterclockwise to add gain to Input 1. This will decrease gain to Input 2. Adjust input knob clockwise to add gain to Input 2. This will decrease gain to Input 1. If you have two audio sources connected to both Input 1 and 2, adjust the level of one input using the VU meter, then adjust the output level of the other audio source. Adjust the input level until the left VU meter(s) occasionally illuminate the red LEDs. Illumination of the red LEDs indicates the unit is in limiting. Limiting is required so that the unit does not over-modulate the transmit signal. If you don't want any audio limiting to occur, make sure the red LEDs never illuminate. If you want a highly limited signal, turn the audio gain up so the red LEDs illuminate often.



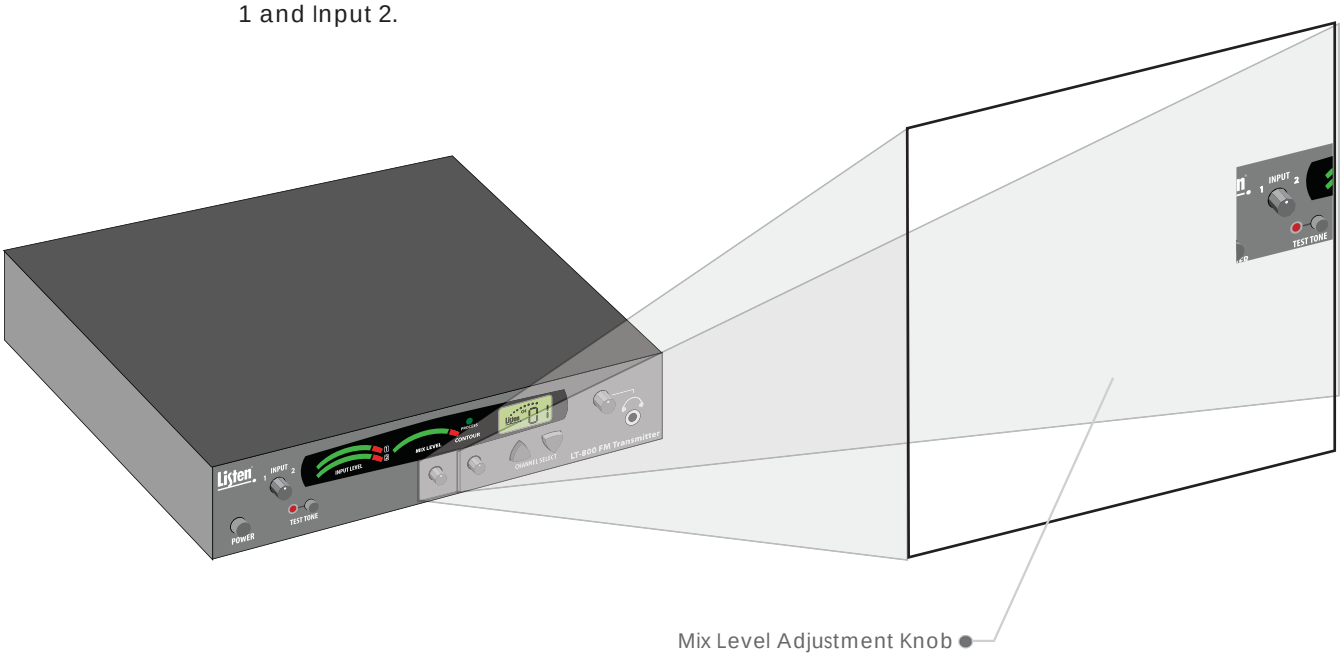
2 Adjusting the Contour knob

Adjust the contour knob counterclockwise if your audio source is mostly voice. Adjust the knob clockwise if your audio source is mostly music. The contour knob adjusts the relative equalization of the unit. This equalization boosts or cuts frequencies above 5 kHz.



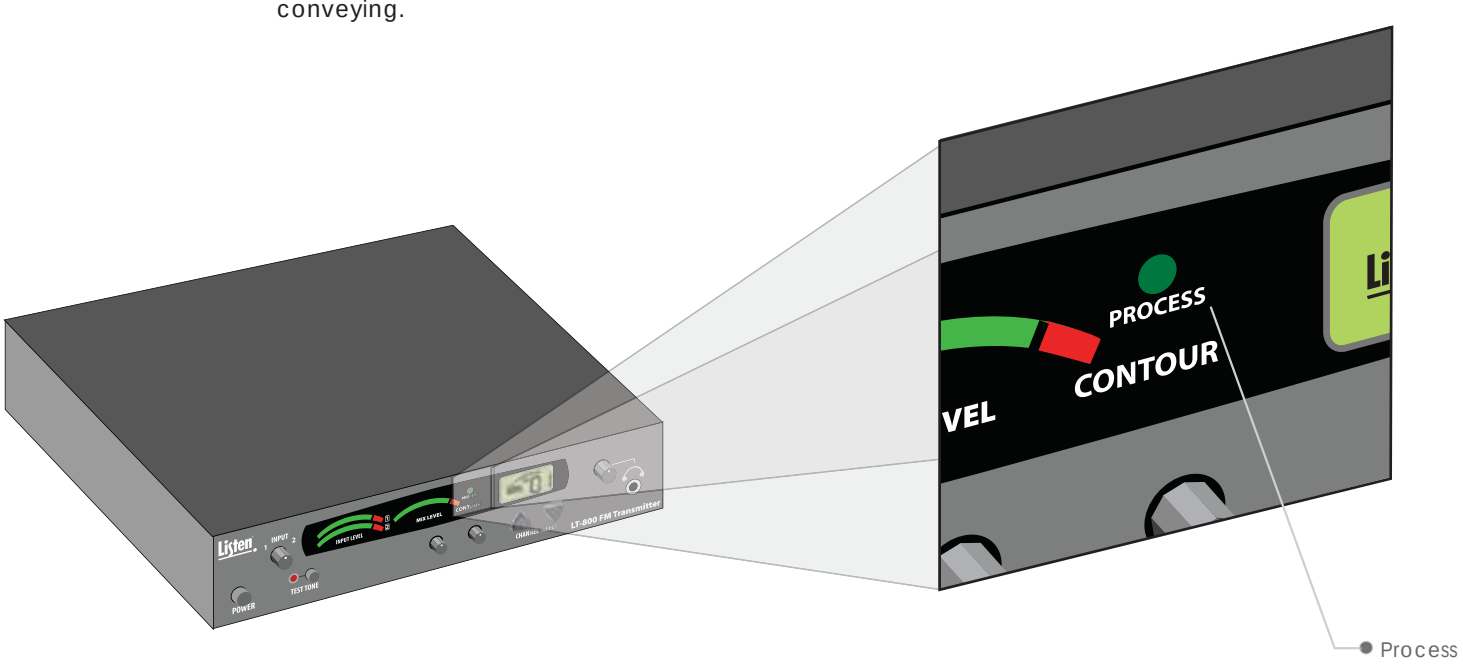
3 Adjust Mix Level

Adjust the mix level until the right VU meter occasionally illuminates the red LED. This is the level adjustment for the combined output from Input 1 and Input 2.



4 Process Mode

Process mode is used for Audio Gain Control (AGC). With the process mode enabled, the LT-800 will automatically adjust for inconsistent signal input levels by raising or lowering the signal level accordingly to provide a consistent sound output level. This feature should be used in applications where a consistent sound level is important and the input levels vary substantially. Typically you would not want to engage the Process Mode when a speaker's emphasis is critical to the message they are conveying.

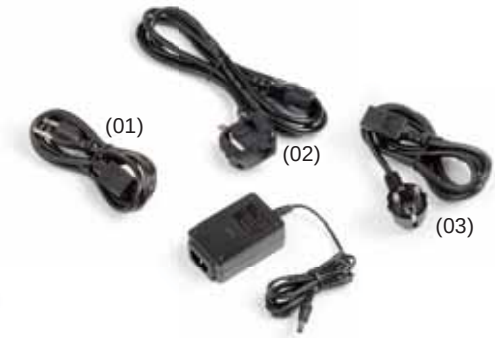


Accessories for LT-800-863

Accessories

LA-131
Antenna Kit for Rack Mount (863 MHz)

LA-130
Remote Antenna Kit (863 MHz)



LA-207
12 VDC Power/Charging
Supply for FM Portable Products
LA-207-01 North America
LA-207-02 Asia/UK
LA-207-03 Euro

LA-304
Assistive Listening
Notification Signage Kit

LA-326
Universal Rack Mounting Kit

Notes

Notes

Notes

Notes

Listen®

www.listentech.com

Stationary FM 863 MHz

LR-400 Portable Display FM Receiver
LR-500 Portable Programmable Display FM Receiver

Don't miss a single sound.

LR-400/500 User's Manual Table of Contents

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LR-400/500 Package Contents

- LR-400/500
- Quick Reference Card
- Warranty Card

LR-400-863
Portable Display
FM Receiver
(863 MHz)

LR-500-863
Portable Programmable
Display FM Receiver
(863 MHz)

Listen Configurations

- LR-400-863
- LR-500-863

LR-400-863 Specifications

Architectural Specification

The LR-400-863 FM receiver shall be capable of receiving on 17 wide band channels with a SNR of 70 dB or greater. The device shall be able to be locked on a single channel. The receiver shall be capable of seeking channels. The device shall have an adjustable squelch. The device shall have an audio frequency response of 50 Hz to 15 KHz, ±3 dB. The device will incorporate a stereo headset jack that allows the user to plug in either a mono or stereo headset. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, and RF signal strength. The receiver shall be able to function in both DX and Local mode. The unit shall operate off of 2 AA batteries. The receiver shall incorporate automatic battery charging circuitry for recharging of NiMH batteries. The Listen LR-400-863 is specified.

	Specifications	LR-400-863
RF	RF Frequency Range	863.050 - 864.950 MHz
	Number of Channels	17 Wideband
	Sensitivity	.6 uV typical, 1 uV maximum for 12 dB sinad
	Frequency Accuracy	± .005% stability 32 to 122º (0 to 50º C)
	Antenna	Integrated External Antenna
	Squelch	Programmable in 20 steps, automatic on loss of RF signal
	Compliance	CE, ETSI, RoHS
Audio	System Frequency Response	50 Hz - 15 kHz (+/-3 dB)
	System Signal to Noise Ratio	70 dB (A-Weighted)
	System Distortion	<2% total harmonic distortion (THD) at 80% deviation
	Output	3.5 mm connector, unbalanced, 0dBu nominal output level, 16 mW maximum, impedance 32 Ohms
Controls	User Controls	Channel up/down, SEEK, volume
	Set-up Controls (battery compartment)	Alkaline/NiMH battery switch
	Programming	Channel Lock, DX/Local, squelch
Indicators	LED	Red, illuminated when unit is on. Flashes when batteries are low, or Charging. Flashes when locked and SEEK is pushed.
	LCD Display	Channel Designation, lock status, signal strength indication, battery life
Power	Battery Type	Type: 2 AA batteries, alkaline or NiMH
	Battery Life (Listen batteries)	20 hours alkaline (LA-361), 10 hours NiMH rechargeable (LA-362)
	Battery Charging (NiMH only)	Fully Automatic, 13 hours maximum
Physical	Dimensions (H x W x D)	5.0 x 3.0 x 1.0 in (13 x 7.6 x 2.5 cm)
	Color	Dark Grey with white silk screening
	Unit Weight	3.9 oz (111 g)
	Unit Weight with batteries	5.8 oz (164 g)
	Shipping Weight	1.0 lbs. (0.45 kg)
	Door	Manually Lockable. Up, down, and power buttons through door. Other controls behind door (see controls)
Environmental	Temperature - Operation	-10 C (14 F) to +40 C (104 F)
	Temperature - Storage	-20 C (-4 F) to +50 C (122 F)
	Humidity	0 to 95% Relative Humidity, non condensing

Specifications are subject to change without notification

LR-500-863 Specifications

Architectural Specification

The LR-500-863 FM receiver shall be capable of receiving on 17 wide band channels with a SNR of 70 dB or greater. The receiver shall be programmable to electronically lock out unneeded channels. The receiver shall be capable of seeking channels. The device shall be able to be locked on a single channel. The device shall have an adjustable squelch. The device shall have an audio frequency response of 50 Hz to 15 KHz, ±3 dB. The device will incorporate a stereo headset jack that allows the user to plug in either a mono or stereo headset. The device shall incorporate an LCD display that indicates channel, battery level, low battery, battery charging, and RF signal strength. The receiver shall be able to function in both DX and Local mode. The unit shall operate off of 2 AA batteries. The receiver shall incorporate automatic battery charging circuitry for recharging of NiMH batteries. The Listen LR-500-863 is specified.

	Specification	LR-500-863
RF	RF Frequency Range	863.050 - 864.950 MHz
	Number of Channels	17 Wideband
	Sensitivity	.6uV typical, 1 uV maximum for 12 dB sinad
	Frequency Accuracy	± .005% stability 32 to 122º (0 to 50º C)
	Antenna	Integrated External Antenna
	Squelch	Programmable in 20 steps, automatic on loss of RF signal
	Compliance	CE, ETSI, RoHS
Audio	System Frequency Response	50 Hz - 15 kHz (+/-3 dB)
	System Signal to Noise Ratio	70 dB (A-Weighted)
	System Distortion	<2% total harmonic distortion (THD) at 80% deviation
	Output	3.5 mm connector, unbalanced, 0dBu nominal output level, 16 mW maximum, impedance 32 Ohms
Controls	User Controls	Channel up/down, SEEK, volume
	Set-up Controls (battery compartment)	Alkaline/NiMH battery switch
	Programming	Channel Lock Out, Channel Lock, DX/Local, squelch
Indicators	LED	Red, illuminated when unit is on. Flashes when batteries are low, or Charging. Flashes when locked and SEEK is pushed.
	LCD Display	Channel Designation, lock status, signal strength indication, programming
Power	Battery Type	Type: 2 AA batteries, alkaline or NiMH
	Battery Life (Listen batteries)	20 hours alkaline (LA-361), 10 hours NiMH rechargeable (LA-362)
	Battery Charging (NiMH only)	Fully Automatic, 13 hours maximum
Physical	Dimensions (H x W x D)	5.0 x 3.0 x 1.0 in (13 x 7.6 x 2.5 cm)
	Color	Dark Grey with white silk screening
	Unit Weight	3.9 oz (111 g)
	Unit Weight with batteries	5.8 oz (164 g)
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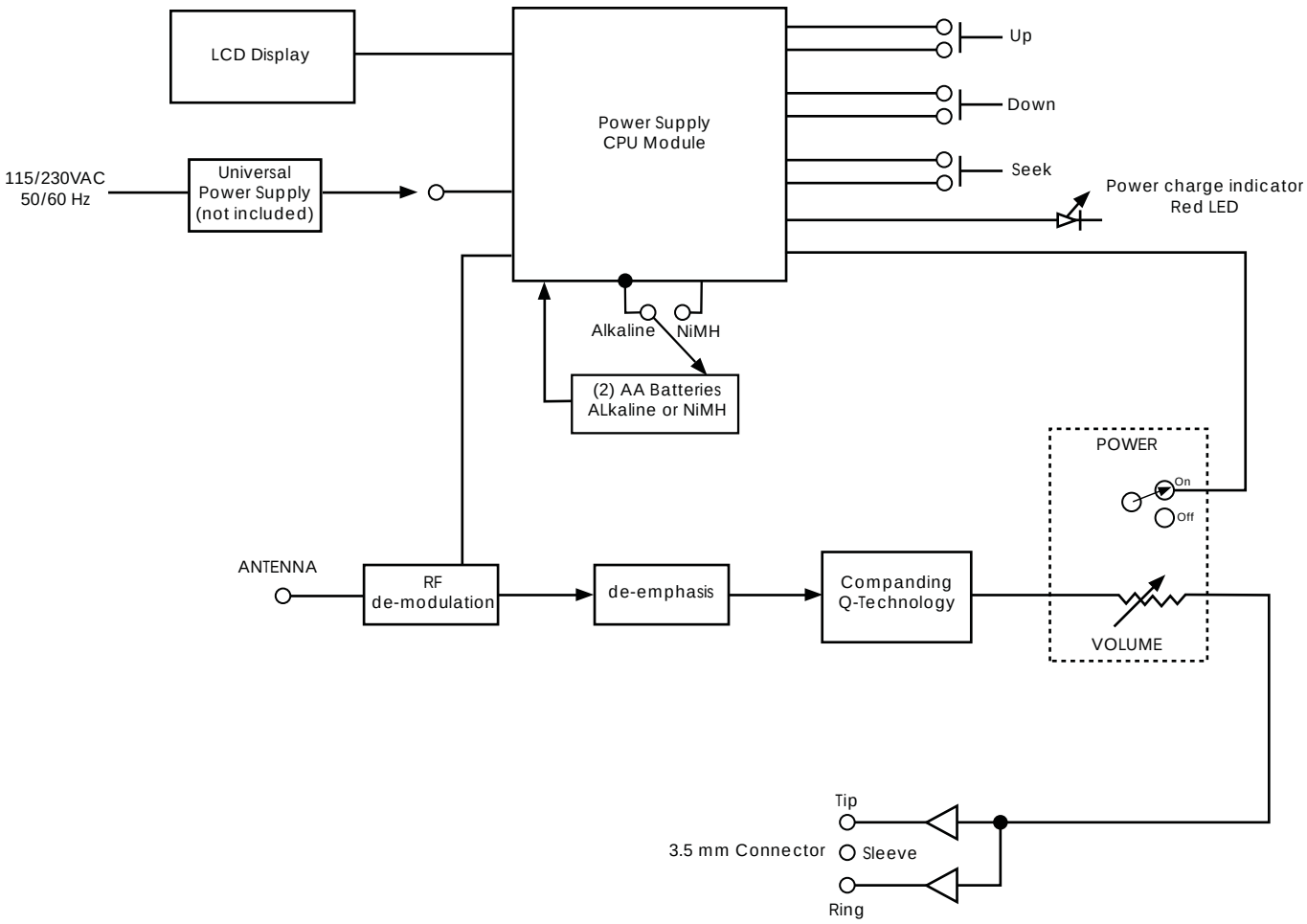
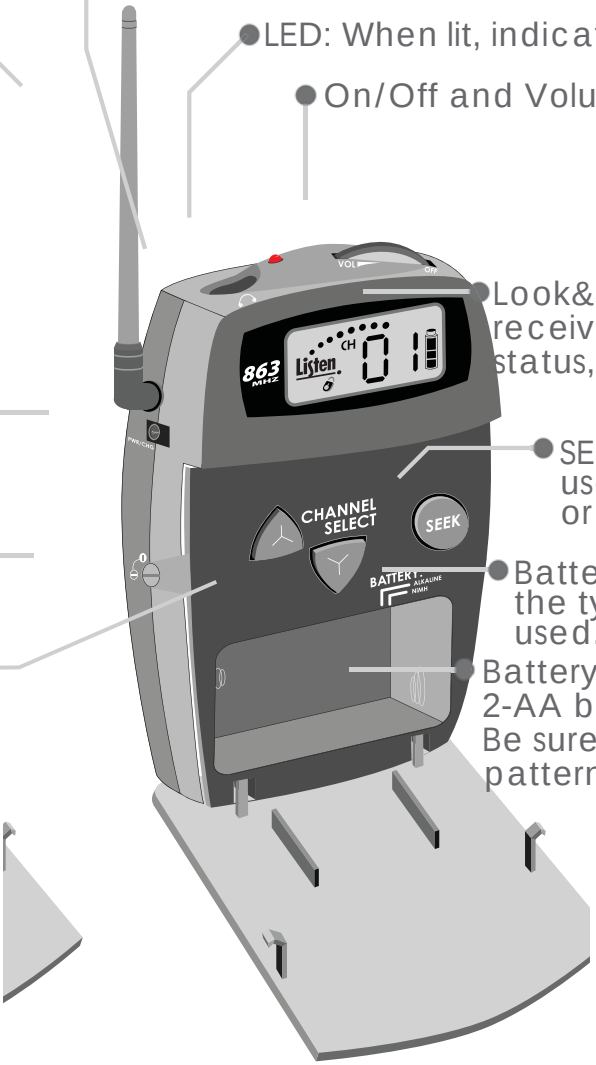
	Door	Manually Lockable. Up, down, and power buttons through door. Other controls behind door (see controls)
Environmental	Temperature - Operation	-10 C (14 F) to +40 C (104 F)
	Temperature - Storage	-20 C (-4 F) to +50 C (122 F)
	Humidity	0 to 95% Relative Humidity, non condensing

Specifications are subject to change without notification

LR-400/500 Block Diagram



LR-400-863 Quick Reference



Articulating Flexible Antenna

3.5 mm Output Jack: Connect a listen earpiece here.

LED: When lit, indicates unit has power.

On/Off and Volume Control Dial.

Look&Listen™ Display: Shows receive level, channel, battery status, and lock status.

Power/Charging Port

SEEK Button: Allows the user to change channels or lock on a channel.

Front Door Lock

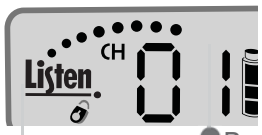
Battery Select Switch: Choose the type of batteries being used.

Channel Select Buttons

Battery Compartment: Place 2-AA batteries in compartment. Be sure to follow polarity pattern.

Channel Display: Displays the channel the LR-400 is currently on.

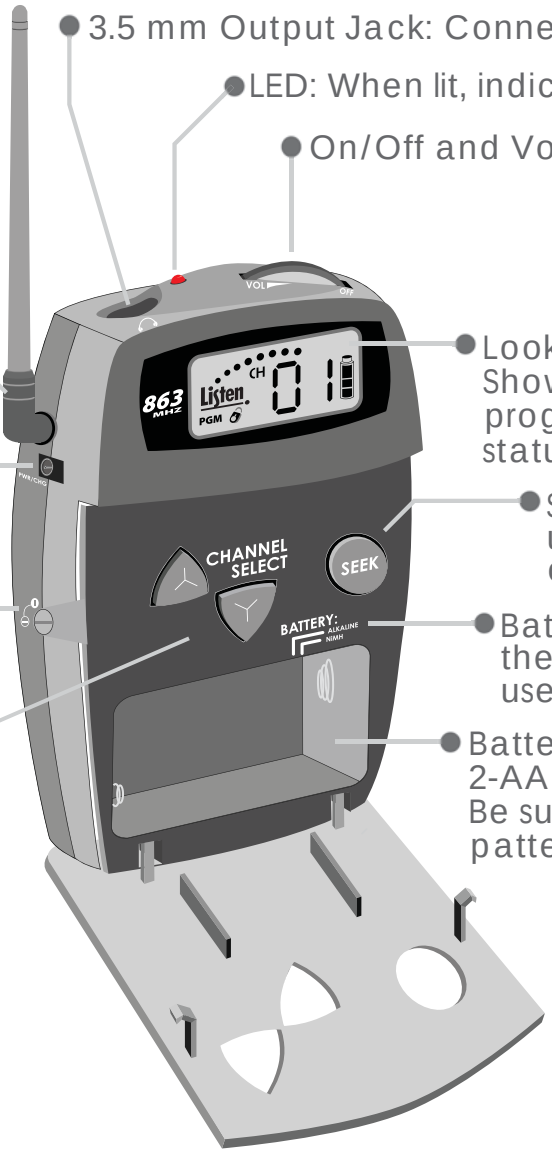
RF Input Indicator: Indicates the RF receive level.



Battery Level Indicator.

Lock Icon: Indicates the unit is locked on current channel.

LR-500-863 Quick Reference



3.5 mm Output Jack: Connect a listen earpiece here.

LED: When lit, indicates unit has power.

On/Off and Volume Control Dial.

Articulating Flexible Antenna

Look&Listen™ Display: Shows receive level, channel, programming, battery status, and lock status.

Power/Charging Port

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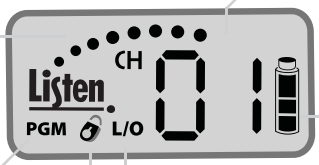
Battery Compartment: Place 2-AA batteries in compartment. Be sure to follow polarity pattern.



Channel Display: Displays the channel the LR-500 is currently on.

RF Input Indicator: Indicates the RF receive level.

Battery Level Indicator.

Program function is in process.

L/O: Indicates while in programming mode the specific channel has been locked out.

Lock Icon: Indicates the unit is locked on current channel

LR-400/500 Setup Instructions

1 Remove the product

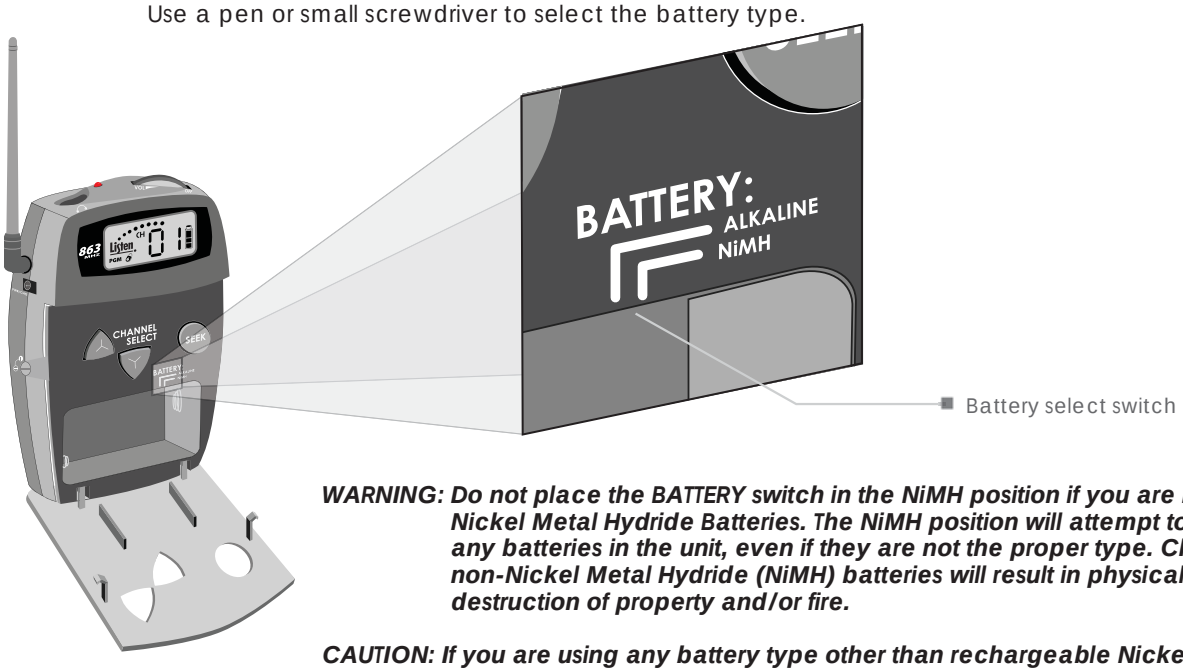
Remove outer packaging and plastic cover. Inspect for physical damage. If damage is apparent, please contact the dealer from which the product was purchased or Listen Technologies Corporation technical support for assistance (refer to page 67 for contact information).

2 Open the front access door

If locked, use a pocketknife or small screwdriver to unlock the door locks on both sides of the unit. To unlock the door, rotate the lock ¼ turn counterclockwise. Grip the two tabs with your thumb and index finger and pull the door downward. DO NOT place batteries in the unit at this time.

3 Select Battery Type

Two types of batteries may be used: The unit is shipped with the switch in the Alkaline position. Use a pen or small screwdriver to select the battery type.



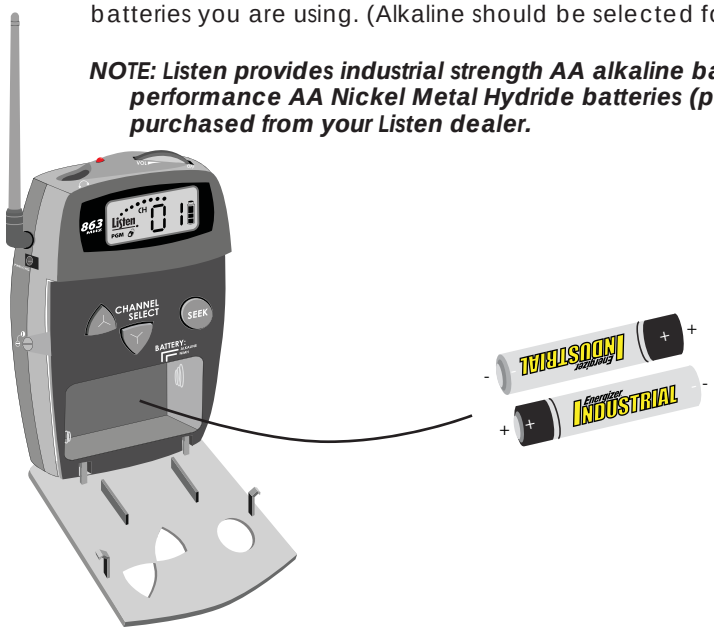
WARNING: Do not place the BATTERY switch in the NiMH position if you are not using Nickel Metal Hydride Batteries. The NiMH position will attempt to charge any batteries in the unit, even if they are not the proper type. Charging non-Nickel Metal Hydride (NiMH) batteries will result in physical harm, destruction of property and/or fire.

CAUTION: If you are using any battery type other than rechargeable Nickel Metal Hydride (NiMH) batteries, make sure the BATTERY selection switch is in the alkaline position.

4 Place Batteries in Unit

Place two AA batteries in the compartment, making note of the battery polarity shown in the battery compartment, and again verifying that the BATTERY SELECT switch is in the correct position for the batteries you are using. (Alkaline should be selected for all battery types other than NiMH).

NOTE: Listen provides industrial strength AA alkaline batteries (part number LA-361) and high performance AA Nickel Metal Hydride batteries (part number LA-362). These may be purchased from your Listen dealer.



5 Connect an Earphone or Headset

Your headset or earphone will connect to the jack on the top of the unit. Either mono or stereo connectors may be used with a Listen receiver. Make certain you push the plug all the way into the jack.

6 Turn the Unit On

Receivers are turned on by rotating the volume dial counterclockwise. The red LED on top of the unit will illuminate and the LCD display should illuminate. If they do not, make sure you have installed the batteries correctly and that you are using fully charged batteries.

1 Turn Unit On

1A Volume knob

Rotate the volume knob counterclockwise with an earphone or headset connected to the unit.

WARNING: Excessive volume may result in hearing damage.

2 Antenna Placement

2A Antenna Position

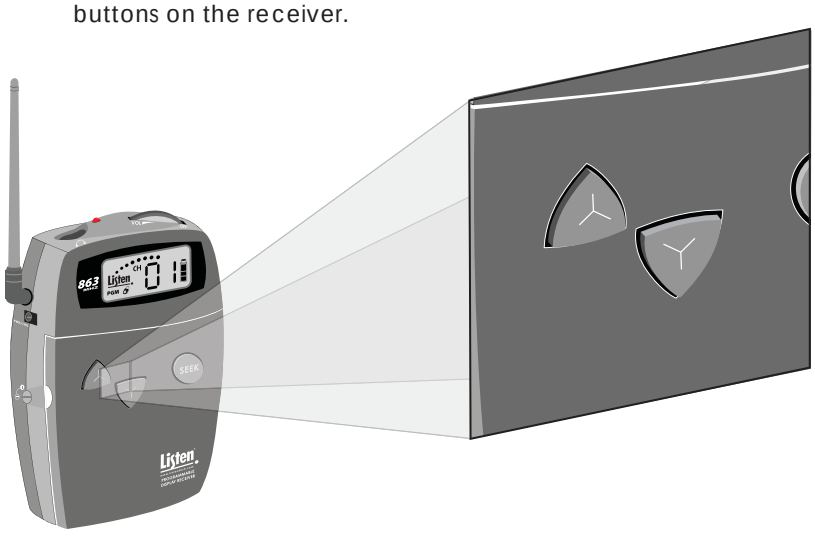
Raise the antenna to the upright position. When the antenna if fully extended, it will click into position.

NOTE: Be aware that the transmission range could decrease if the antenna is not in an upright position.

3 Select a Channel

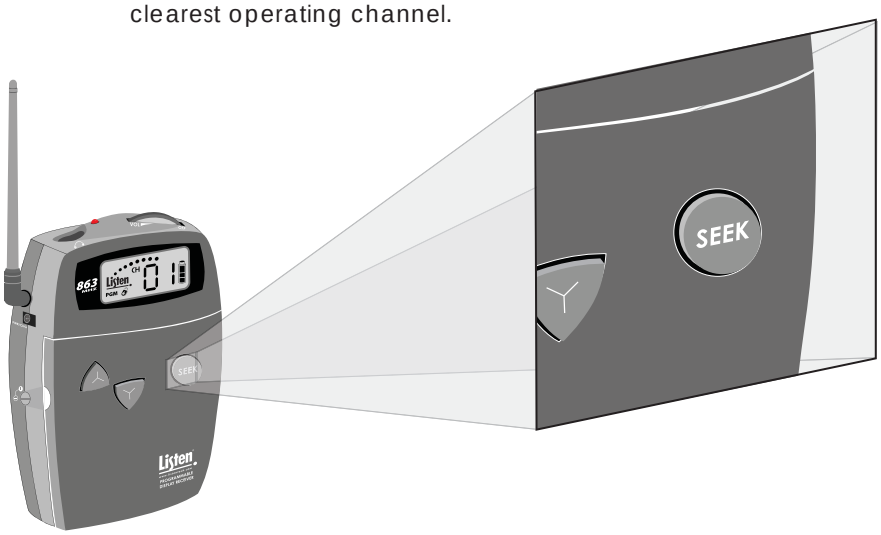
3A Select the channel using channel select buttons

Select the channel to match the transmission channel by pressing the UP and DOWN buttons on the receiver.



3A *Select the channel using SEEK*

Another way to find a channel on the LR-400/500 is to use the SEEK button. When you do this, the Listen receiver looks for the next active channel. Sometimes the unit will mistake interference for a real broadcast signal. If you get interference, press the SEEK button again. The unit may stop on a channel that is close to the actual broadcast channel, in which case the channel will sound noisy or distorted. Simply press SEEK again until you find the clearest operating channel.



4 *Adjust the volume control*

Use the control dial on the top of the unit to adjust the volume to a comfortable level.

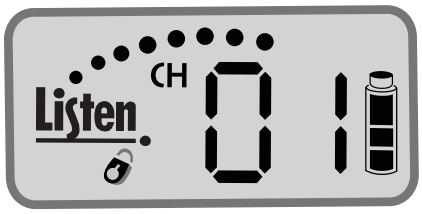
Locking the Receiver on One Channel

The unit can be electronically locked on one channel so that it will not change channels even if the "SEEK" button is pressed. It is recommended to lock the receiver on a channel that is being used in a single channel system or when multiple systems are in the same area.

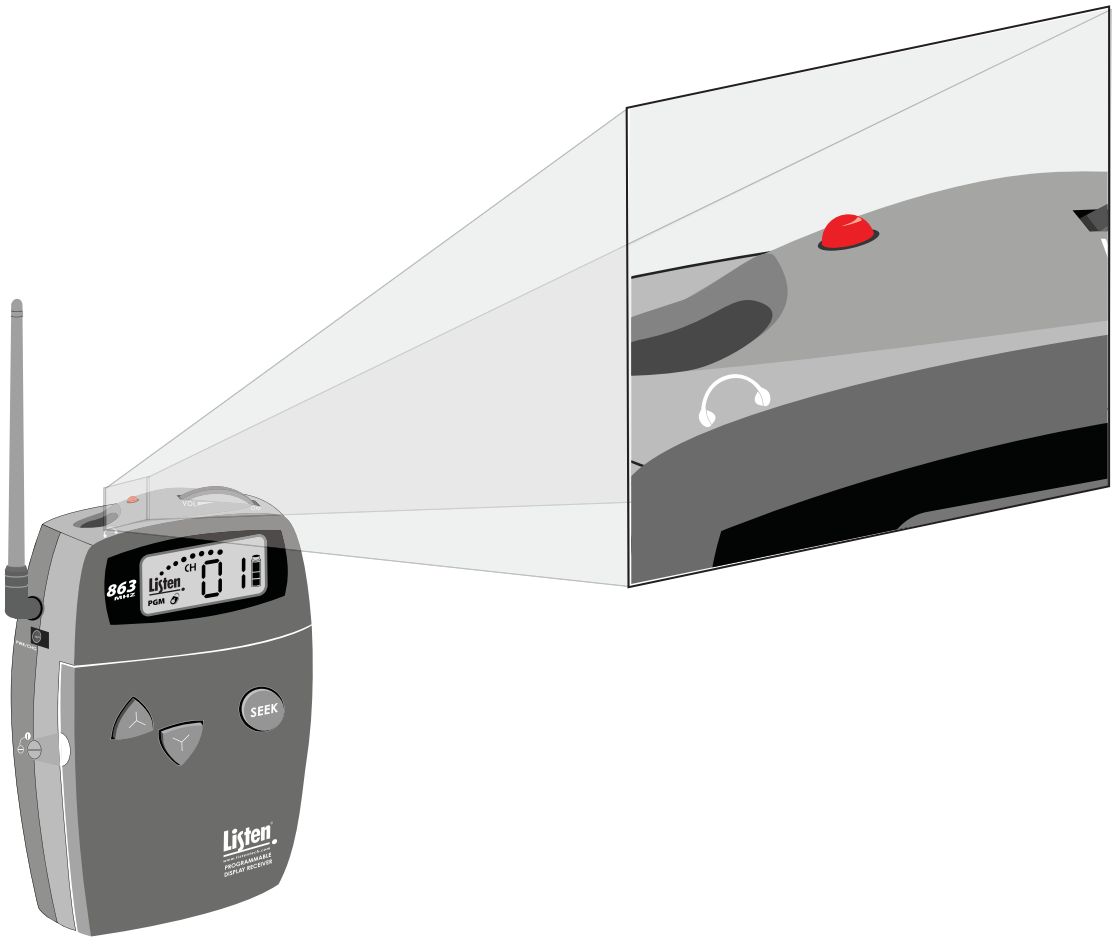
1 To lock on a channel

1A Press and hold the SEEK button for 5 seconds

Press and hold the SEEK button for 5 seconds to lock a receiver onto the currently tuned channel. Press and hold the button again to unlock. When locked the LED on top of the unit will flash when you press the SEEK button.



NOTE: On the LR-400/500, when the channel is locked, a lock icon will appear underneath "Listen" on the display. Also if the unit is locked, the red LED on top of the receiver will flash when the SEEK button is pressed.



Squelch Programming

Entering Squelch Program Mode

1. Turn unit off
2. Press and hold the SEEK button; while holding SEEK button down, turn the ON/OFF/VOLUME dial to turn the unit on.
3. Release the SEEK button when the Listen name disappears (approximately 2 seconds) and a two digit display is seen.

Adjusting the Squelch level

1. Use the Channel UP and DOWN buttons to raise or lower the squelch sensitivity settings (refer to the chart on page 49 for settings.
2. Lower numbers mean that a less powerful and possibly noisy signal will be heard, but you can have a longer range before the unit will squelch.
3. Once the desired squelch setting is found, press SEEK to exit the squelch programming mode.

NOTE: Keep in mind, low squelch may allow multipath and squelch chattering at long distances.

Squelch setting 00 is no squelch; this setting disables the squelching capabilities of the receiver. Squelch setting 20 is maximum squelch sensitivity; when on this setting, there must be a very strong and stable RF signal for the unit to not engage the squelch feature.

NOTE: For squelch settings 1-3, the squelch function is slow which allows for maximum transmission range. For squelch settings 4-20 the squelch function is fast to ensure little radio noise is heard during the squelch function.

Squelch

The purpose of squelch is to mute the audio output of your receiver when the signal from the transmitter is turned off or is too weak to be received. Without squelch you would hear radio noise in your earphone. The squelch on your receiver can be adjusted so that it will mute the audio on different RF signal strengths. This is useful as follows:

Set the squelch setting to the highest level

To ensure that users don't hear transmissions from other transmitters, set the squelch setting to the highest level that doesn't squelch the receiver.

If the receiver is close to the transmitter, set the squelch high

If the receiver is going to be close to the transmitter (i.e. in a classroom), set the squelch setting high so that when the transmitter is turned off it immediately squelches and ignores transmitters in other rooms.

If in an area that has a lot of interference, set the squelch high

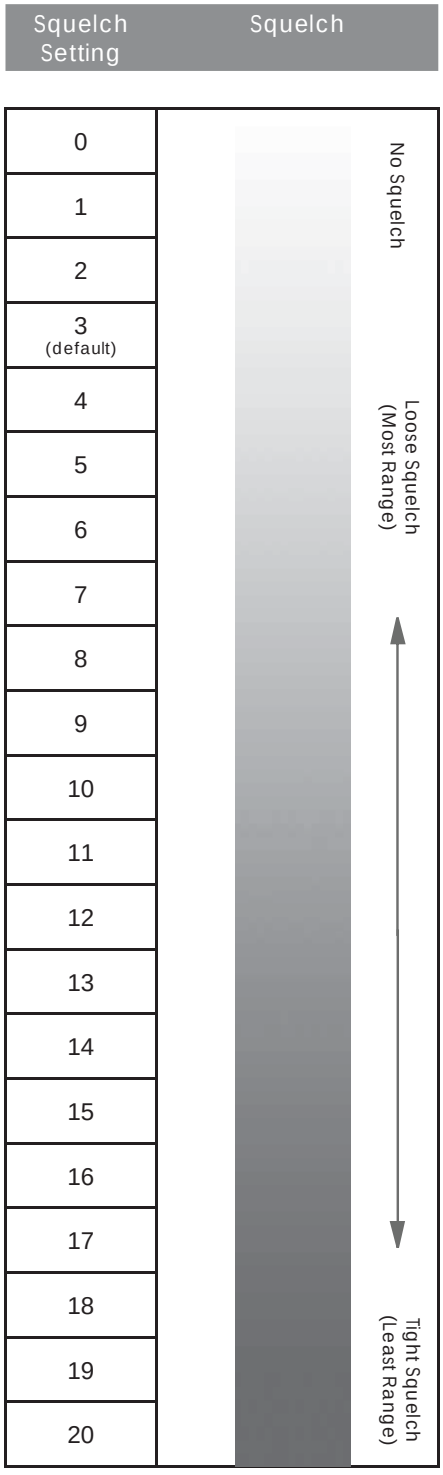
If you are in an area that has a lot of inference, you may want to set the squelch setting to a high setting to ensure the interference is not picked up by the receiver.

For maximum amount of range, set the squelch to a low level

If you need the maximum amount of range, you may want to consider setting the squelch setting to a low level (0, 1 or 2).

NOTE: Default squelch setting is 3

CAUTION: When setting the squelch level low the reliability of squelch function is compromised. This will cause radio noise to be heard in the earphone and there is a possibility of hearing damage.



DX/Local

DX is the normal operational mode. Local mode can effectively limit any inter-modulation and/or interference in a busy RF environment. This is done by limiting the amount of RF gain in the receiver. When local mode is selected, the range of the receiver is compromised. Depending on your application and environment, Local mode may be necessary for better performance. DX mode is default.

DX Mode (default)

DX is normal operation. The local mode feature can be used when many frequencies are being used.

Local mode

Only strong channels will be automatically tuned in

1 To change to DX/Local mode

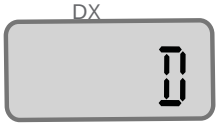
1A While the unit is OFF, press and hold the channel down button and turn the unit on.

1B The LCD shall indicate the current setting “D” or “L”.

1C Pressing the down button will toggle between Local and DX Mode; “D” or “L”.

1D Pressing seek will enter the setting and return to normal operational mode.

DX



Local

Resetting to defaults

To reset the receiver to default settings, follow these instructions:

1 Reset to default settings

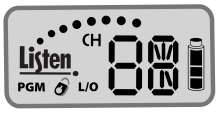
1A ***Press and hold the Up and Down channel buttons while turning the unit on.***

Press and hold the Up and Down channel buttons while turning the unit on. This will light up all segments of the display.

1B ***After the receiver has been reset***

After the receiver has been reset, the display will return with defaults present.

NOTE: The defaults are
- ***Channel: 01***
- **** Channel lockout: All channels active***



LR-500 Programming Instructions (LR-500 only)

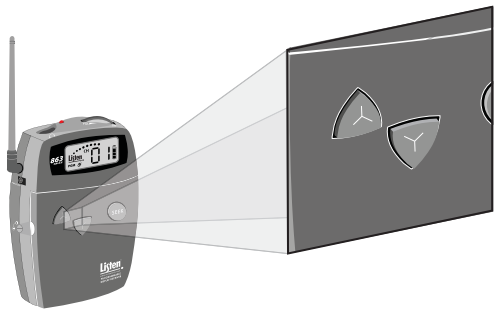
Programming Instructions

The LR-500 can be programmed to receive on a limited number of channels. When an application requires the use of more than one channel (i.e. a classroom or language interpretation), the receiver can be programmed to view only the necessary channels.

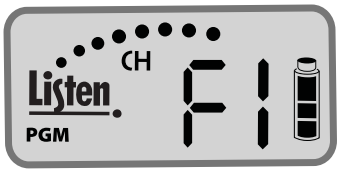
Entering Program Mode

1 **To enter program mode**

1A While the unit is ON, press and hold the channel down and up buttons simultaneously for 3 seconds.

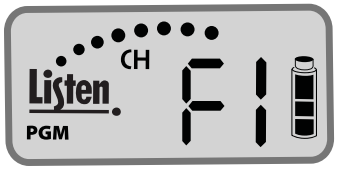


1B The "PGM" icon on the LCD will appear indicating program mode is active.



2 **To program**

2A Once in the program mode, a function menu is displayed. Function 1 (F1) is displayed as default. Pressing the channel up or down buttons will scroll through the functions (F1). Pressing the seek button will enter that particular function.



F1- Channel Lock out. No channels are locked out as default. Pressing the up and down buttons will scroll through channels. Pressing the seek button will toggle between available and locked out for that channel. When a channel is locked out, the L/O on the LCD shall be displayed.

NOTE: Although it is possible to display an F2 function while in program mode, there is no F2 function at this time. Listen may add another programming function in the future, but there is only one programming function (F1) on the 863 MHz receivers.

3 When no button is pressed for 10 seconds, the program menu is exited altogether, regardless of whether a function is entered or not. To exit out of the program menu or function manually:

3A When in the programming menu: Press and hold power for 2 seconds. This exits the program mode.

3B When in a programming function: Press and hold power for 2 seconds. This exits the function and goes back to the programming menu.

3C Pressing and holding power for a full 4 seconds will exit both programming function and programming menu.

Accessories for LR-400/500

Accessories

LA-164
Ear Speaker

LA-165
Stereo Headphones

LA-166
Neck Loop

LA-170
Behind-the-Head
Stereo Headphones

LA-304
Assistive Listening
Notification Signage Kit

LA-361
High Capacity AA Alkaline
Batteries (2)

LA-362
Rechargeable AA NiMH
Batteries (2)

LA-311 16-Unit Portable Charging/Carrying Case
LA-313 16-Unit Portable Carrying Case
LA-317 4-Unit Portable Charging/Carrying Case
LA-318 4-Unit Portable Carrying Case
LA-320 Configurable Carrying Case
LA-321 8-Unit Portable Charging/Carrying Case
LA-322 8-Unit Portable Carrying Case
LA-323 4-Unit Portable Charging/Carrying Case w/Removable Lid
LA-324 8-Unit Portable Charging/Carrying Case w/Removable Lid
LA-325 16-Unit Portable Charging/Carrying Case w/Removable Lid

Notes

Notes

Listen®

www.listentech.com

Stationary FM 863 MHz

Supplementary Information

Don't miss a single sound.

Supplementary Information Table of Contents

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Battery Charging Information

The Listen receivers are unique because they have SmartCharge™ chargers built in. When any of these units are placed into a Listen charging case, NiMH batteries will be charged.

SmartCharge™ uses a pulse charging, which greatly extends the life of Nickel Metal Hydride (NiMH) batteries. The entire charging process takes about 13 hours. Listen recommends that you allow the charger to complete its full cycle every time for maximum battery life.

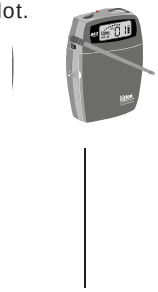
During the charge cycle, the red LED on top of the Listen product will flash slowly. When charging is completed, the LED will turn off. It is not necessary to unplug the charger; however, if you unplug the unit from the charger and then plug it back in, it will begin the 13-hour charge cycle over again. (show top of a receiver [LED])

When not using the receiver, it is recommended to leave the unit on the charger. The charger provides a "maintenance" charge that keeps the battery at 100%. If the unit is not on the charger, the battery will lose up to 20% of its charge per month.

NOTE: Listen provides 2300 mAH (milli-Amp-hour) constant current NiMH Nickel Metal Hydride) batteries. These may be purchased from Listen (part number LA-362).

Charging with a drop-in charger

To charge the batteries using a drop-in charger, simply place the unit into a slot in the charger and connect the charger to power. Make sure the unit is fully seated in its slot.



IMPORTANT: DO NOT ATTEMPT TO CHARGE ANY TYPE OF BATTERY OTHER THAN NiMH (NICKEL METAL HYDRIDE) with your Listen equipment. Alkaline batteries may explode when connected to a charger. Other risks of charging non-NiMH batteries include destruction of property or fire.

IMPORTANT: In order to charge NiMH batteries, the BATTERY SELECT switch in your Listen product must be set to the NiMH setting. Use a pen or small screwdriver to move the switch (located in the battery compartment) to the proper position.

WARNING: The case lid MUST be open or removed while the units are charging. The charging process generates heat. Air ventilation is required. It is best to store your charging case at room temperature away from heat sources and direct sunlight

Frequency Chart

Frequencies	
Channel	**Frequency (MHz)**
01	863.050
02	863.200
03	863.400
04	863.550
05	863.750
06	863.900
07	864.100
08	864.250
09	864.450
10	864.600
11	864.800
12	864.950
13	863.300
14	863.650
15	864.000
16	864.350
17	864.700

Troubleshooting

The LT-800 has no power.

Make sure the 12 VDC power transformer is connected to a power source and is connected to the jack marked "Power Input". Make sure the POWER button is pressed in.

There is no audio or the audio level is too low.

1. Make sure that your audio source is properly connected to Input 1 and/or Input 2. The Input 1 or Input 2 switches must be in the correct position for the appropriate input level. For example: if you are using the output of a mixer on Input 2, the switch should be in the -10 dBu position. If it were to be in the +10 dBu position, the level would be too low. Also, check the Input knob to ensure it is properly adjusted. You should be able to see the VU meter deflect on Input 1 or Input 2 corresponding with the input level of the audio source. You can listen to the audio source by connecting a headset to the front panel jack and adjusting the Monitor volume control.

2. If the level of audio into the transmitter is low and can't be corrected using the level input switches, the audio processor can be turned on to boost the signal (page 33 for description of Process Mode).

The audio is distorted.

Check to make sure you have the input level select switches in the proper position. You may be providing too much audio level for the input stage to handle.

There is hum in the audio.

Make sure you have properly grounded the audio source to the LT-800. Check the connections from the audio source to the LT-800. If you can, try to use a balanced audio source - this will reduce the chance of creating hum. Connect a ground wire from the LT-800 to ground and/or to the ground of the source audio.

There is a tone.

The Test Tone button has been pressed (its LED light is on). Push the Test Tone button to turn off the tone.

The Audio Input 1 sounds "tinny".

If you are using an unbalanced audio source, make sure Pin 3 on the XLR or the ring on the ¼" plug is grounded .

I cannot pick up the signal on the receiver.

Check to make sure the receiver and the transmitter are on the same channel. Make sure the LT-800 has an antenna connected. Ensure that the receiver has the antenna pointed upward.

I can pick up the signal on the receiver, but it sounds like it's not tuned in.

Check to make sure the transmitter and receiver are on exactly the same channel. It's a good idea to lock the channels once they have been set. To lock the LT-800, press the UP button for 3 seconds. To Lock receiver on a channel, hold the seek for 3 seconds

There is not sufficient range.

First make sure that the receivers you are using are operating properly, then make sure that you have an antenna connected either to the top of the LT-800 transmitter or connected to the back of the unit (but not both!). The antenna should be as high as possible and free of obstacles. In addition make sure you are using the correct antenna type for your unit. You might want to use a remote antenna [LA-130 Remote Antenna Kit (863 MHz)] that can be mounted on a mast or wall. Try using different frequencies to find one with less interference. (please refer to design guide)

Troubleshooting

There is interference in my transmission.

Ensure that the transmitter and receivers are on the same channel. Verify that there are no other transmitters on the same channel or a close channel to the one exhibiting interference. Try different channels until you find a clear channel. Please contact Listen for more ideas on troubleshooting the interference.

End users are adjusting the unit.

First, lock the channel by pressing and holding the channel select UP button for 3 seconds. Consider removing the Input, Mix Level and Contour knobs. You can order a rack mount kit from Listen which offers a security cover that will limit access to the unit.

Can I use another manfactures receivers with the LT-800-863.

Listen's 863 MHz equipment is not compatible with any other 863 MHz equipment.

Several transmitters are operating in the same environment.

For this, you'll need to choose your transmitting frequencies carefully. See pages 15-16 for more details.

Can I have two antenna's connected to my transmitter.

No. The LT-800 transmitter can use only one antenna connection at a time. You may connect either a top mount antenna through the top antenna port, or a remote antenna connected to the BNC connection on the rear of the unit. If multiple antennae are simultaneously connected to both ports the transmitter will have extremely poor broadcast performance and range.

Frequently Asked Questions

Q Does the LT-800 include the rack mount?

A No, but the LA-326 Universal Rack Mount Kit may be ordered to compliment the LT-800.

Q Do I need a transmitter for each audio source?

A No, Each Transmitter can mix two different input sources.

Q What is the range of the LT-800-863 Transmitter?

A Line of site 122 m (400 ft).

Q How many transmitters can be placed in one room?

A Up to eight can be used simultaneously.

Q Can the LR-500 be used with multiple transmitters?

A Yes. We recommend the LR-500 for use with multiple transmitters. The LR-500 is programmable and can be set to just those channels you need.

Q How many channels can I program into the LR-500?

A 1 to 17. The receiver has 17 channels and you can program it to have just the channels you want to have access to. It can be a two channel receiver, a 12 channel receiver, or keep all 17.

Q How many receivers can I have in a system?

A As many as you need, the number is endless.

Q What is the difference between the LR-400 and the LR-500?

A Both receivers can tune to 17 broadband channels. However the LR-400 has the buttons to make changes under the battery compartment door and the LR-400 is not programmable to lock out channels. If you plan to use one receiver with multiple transmitters you should use the LR-500 which is programmable to just those channels you need.

Frequently Asked Questions

Q Can the receiver be “locked” on a channel if I need that?

A Yes. All Listen receivers can be locked.

Q What is the battery life of a receiver?

A 20 hours using alkaline batteries. 10 hours using NiMH batteries.

Compliance, Warranty and Contact Information

Compliance Information

The following compliance information applies to the LT-800-863, LT-700-863, LR-500-863 and LR-400-863

These devices comply with ETSI EN 301 357

These devices are CE compliant.

These devices are RoHS compliant.

CE RoHS

Warranty

Listen Technologies Corporation (Listen) warrants its transmitters and receivers (models LT-700, LT-800, LR-42, LR-44, LR-100, LR-300, LR-400, LR-500 and LR-600) to be free from defects in workmanship and material under normal use and conditions for the useful lifetime of the product from date of purchase.

Listen warrants it's Stationary IR Radiators (LA-140) to be free from defects in workmanship and material under normal use and conditions for three years from the date of purchase.

Listen warrants its Noise Canceling Microphone (LA-270) to be free from defects in workmanship and material under normal use and conditions for one year from date of purchase.

Listen warrants its Charging/Carrying Cases (LA-306, LA-311, LA-313, LA-317, LA-318, LA-319, LA-320, LA-321, LA-322, LA-323, LA-324, LA-325) to be free from defects in workmanship and material under normal use and conditions for one year from date of purchase.

All other products and accessories are warranted for 90 days from date of purchase.

This warranty is only available to the original end purchaser of the product and cannot be transferred. Warranty is only valid if warranty card has been returned, or online warranty registration, has been completed within 90 days of purchase. This warranty is void if damage occurred because of misuse or if the product has been repaired or modified by anyone other than a factory authorized service technician. Warranty does not cover normal wear and tear on the product or any other physical damage unless the damage was the result of a manufacturing defect. Warranty does not include inbound freight costs. Listen is not liable for consequential damages due to any failure of equipment to perform as intended. Listen shall bear no responsibility or obligation with respect to the manner of use of any equipment sold by it. Listen specifically disclaims and negates any warranty of merchantability or fitness of use of such equipment including, without limitation, any warranty that the use of such equipment for any purpose will comply with applicable laws and regulations. The terms of the warranty are governed by the laws of the state of Utah.

In the first ninety days after purchase, any defective product will be replaced with a new unit. After 90 days, Listen will, at its own discretion either repair or replace transmitters and receivers with a new unit or a unit of similar type and condition. Product that is not covered under warranty shall be repaired or replaced with a unit of similar type and condition based on a flat fee.

This limited warranty, prices and the specifications of products are subject to change without notice.

Contacting Listen

If technical service is needed, please contact Listen. Pre-authorization is required before returning Listen products. If products were damaged in shipment, please contact the carrier, then contact Listen for replacement or repair requirements payable by the carrier.
All Listen European markets are supported through the Listen Technologies GmbH office located in Oberasbach, Germany. For more information on Listen solutions, contact Listen Technologies at +1.801.233.8992, +1.800.330.0891 North America, Listen Technologies GmbH at +49 911 955159-0 or visit www.listentech.com. For Europe, Middle East, Africa and India office visit www.listentech.de.

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